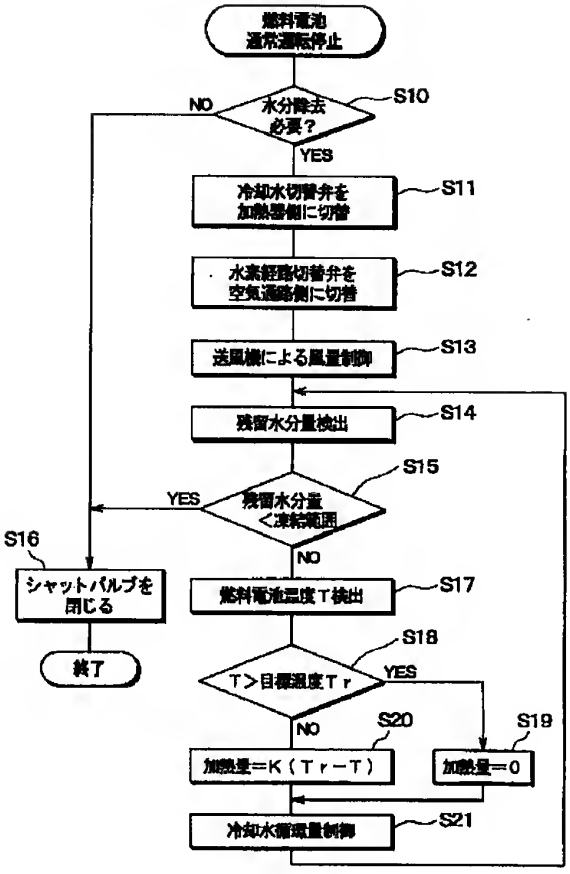

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I. PATENT ABSTRACTS OF JAPAN

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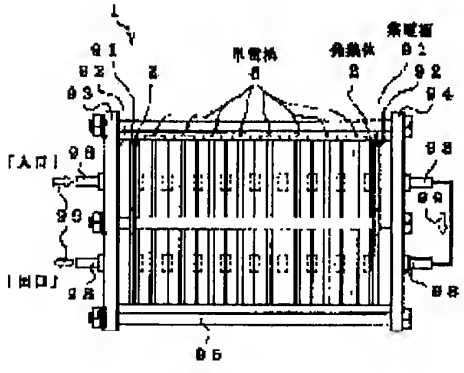
(54) SOLID HIGH POLYMER ELECTROLYTE FUEL CELL

(57)Abstract:
PURPOSE: To provide a solid high polymer electrolyte fuel cell by which the temperature distribution in the layering direction of a unit fuel cell can be easily uniformized.
CONSTITUTION: In a solid high polymer electrolyte fuel cell (a stack) 1, thin plate like heating elements 2 where an electric current outputted from the stack 1 is flowed in its thickness direction, are sandwiched and inserted between respective current collecting plates 91 and cells 6 adjacent to these current collecting plates 91. The heating elements 2 are obtained by forming a thin plate of an electric heating alloy material having a volume resistivity value of about 1.0 to 1.5μm in the area equal to an area directional dimension possessed by a fuel electrode and an oxidizing agent electrode provided in the cells 6. A thickness of the heating elements 2 is determined so that a value of Joule heat generated in the heating elements 2 by an electric current outputted from the stack 1 becomes a value corresponding to a quantity of heat diffused from an end part of the layering direction of the stack 1.



CLAIMS

[Claim(s)]
[Claim 1]A fluid for cooling from which heat which was provided with the following and generated in a fuel cell cell is removed, . After being supplied from the outside of a layered product of a unit fuel cell via a piping connection object for supply sides of a fluid for cooling and cooling a unit fuel cell, it is what is discharged by the exterior of a layered product of a unit fuel cell via a piping connection object for the discharge sides of a fluid for cooling. In a solid polyelectrolyte type fuel cell, to a part of a collecting electrode plate contacted by lateral surface of a separator of a layered product of a unit fuel cell located in both terminals at least. A solid polyelectrolyte type fuel cell characterized by coming to form a heating element heated by current which a solid polyelectrolyte type fuel cell outputs.
A fuel cell cell which generates direct current power in response to supply of fuel gas and oxidant gas, One pair of separators with which a gas conduction slot for making each of both principal planes of a fuel cell cell counter, being arranged, and supplying fuel gas or oxidant gas to a fuel cell cell is formed, Have two or more ****** unit fuel cells, and unit fuel cells, such as this, Make the side by the side of an anti-gas conduction slot of the separator counter the side by the side of an anti-gas conduction slot of a separator which a unit fuel cell which adjoins each other mutually has, and a layered product of an adjacent unit fuel cell and a unit fuel cell laminated mutually is made, A collecting electrode plate made from a conducting material contacted by lateral surface of a separator of a layered product of this unit fuel cell located in both terminals at least.
An electrical insulation board made from an electric insulation material contacted by lateral surface of a collecting electrode plate located in a both-ends tail of a layered product of a unit fuel cell at least of collecting electrode plates, such as this.
A pressure plate which gives welding pressure which is contacted by lateral surface of an electrical insulation board located in a both-ends tail of a layered product of a unit fuel cell at least of electrical insulation boards, such as this, and pressurizes a layered product of a unit fuel cell, a collecting electrode plate, and an electrical insulation board in laminating directions, such as this.
A piping connection object for fluids for cooling installed in a part which supplies a fluid for cooling from which heat generated in a fuel cell cell is removed, and a part to discharge.

[Claim 2]A solid polyelectrolyte type fuel cell, wherein a heating element formed in a part of a collecting electrode plate in the solid polyelectrolyte type fuel cell according to claim 1 is a heating element of being laminated and a product made from electrical resistance materials

****(ed) between a layered product of a unit fuel cell, and a collecting electrode plate.
[Claim 3]A solid polyelectrolyte type fuel cell, wherein a heating element formed in a part of a collecting electrode plate in the solid polyelectrolyte type fuel cell according to claim 1 is a collecting electrode plate made from electrical resistance materials.
[Claim 4]A solid polyelectrolyte type fuel cell comprising:
A fuel cell cell which generates direct current power in response to supply of fuel gas and oxidant gas, One pair of separators with which a gas conduction slot for making each of both principal planes of a fuel cell cell counter, being arranged, and supplying fuel gas or oxidant gas to a fuel cell cell is formed, Have two or more ****** unit fuel cells, and unit fuel cells, such as this, Make the side by the side of an anti-gas conduction slot of the separator counter the side by the side of an anti-gas conduction slot of a separator which a unit fuel cell which adjoins each other mutually has, and a layered product of an adjacent unit fuel cell and a unit fuel cell laminated mutually is made, A collecting electrode plate made from a conducting material contacted by lateral surface of a separator of a layered product of this unit fuel cell located in both terminals at least.
An electrical insulation board made from an electric insulation material contacted by lateral surface of a collecting electrode platc located in a both-ends tail of a layered product of a unit fuel cell at least of collecting electrode plates, such as this.
A pressure plate which gives welding pressure which is contacted by lateral surface of an electrical insulation board located in a both-ends tail of a layered product of a unit fuel cell at least of electrical insulation boards, such as this, and pressurizes a layered product of a unit fuel cell, a collecting electrode plate, and an electrical insulation board in laminating directions, such as this.
It has a piping connection object for fluids for cooling installed in a part which supplies a fluid for cooling from which heat generated in a fucl cell cell is removed, and a part to discharge, A fluid for cooling from which heat generated in a fuel cell cell is removed, . After being supplied from the outside of a layered product of a unit fuel cell via a piping connection object for supply sides of a fluid for cooling and cooling a unit fuel cell, it is what is discharged by the exterior of a layered product of a unit fuel cell via a piping connection object for the discharge sides of a fluid for cooling. A heating unit heated by a fluid for cooling in which temperature rose in a solid polyelectrolyte type fuel cell because a collecting electrode plate cools a unit fuel cell.

[Claim 5]A solid polyelectrolyte type fuel cell, wherein a heating unit with which a collecting electrode plate is provided in the solid polyelectrolyte type fuel cell according to claim 4 is a flowing path for fluids for cooling which carries out conduction of the fluid for cooling in which temperature rose by being formed in a collecting electrode plate and cooling a unit fuel cell.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application]This invention relates to that structure improved so that equalization of the temperature distribution in the laminating direction of a unit fuel cell of the temperature of the fuel cell cell which a unit fuel cell has might become easy with respect to a solid

polyelectrolyte type fuel cell.
[0002]
[Description of the Prior Art]As a fuel cell, various kinds of fuel cells, such as a solid polymer electrolyte type, a phosphoric acid type, a melting carbonate type, and a solid oxide type, are known by the kind of electrolyte used for this. Among this, when a solid polyelectrolyte type fuel cell carries out the water of the polymers resin layer which has a proton (hydrogen ion) exchange group in a molecule to saturation, it is a fuel cell using low resistivity being shown and functioning as a proton conductivity electrolyte. As a polymers resin layer (it is sometimes only henceforth called [solid polyelectrolyte membrane or] PE film for short.) which has a proton exchange group in this molecule, What uses the cation exchange membrane of a polystyrene system with a sulfonic group as a cation conductive film, a perfluoro sulfonic-acid-type-resin film (for example, the U.S. Du Pont make, a trade name Nafion film), etc. are used. By carrying out water to saturation, solid polyelectrolyte membrane (PE film), such as this, is ordinary temperature, and is 20. [Omega-cm] The following resistivity is shown and all function as a proton conductivity electrolyte.
[0003]In a solid polyelectrolyte type fuel cell, on both sides of this PE film, a fuel electrode (it is also an anode pole.), arranging the oxidant electrode (it is also a cathode pole.) -- a fuel electrode -- fuel gas (for example, it is the gas which contained hydrogen or hydrogen in high concentration.) -- oxidant gas (for example, it is air.) is supplied to an oxidant electrode, respectively. In fuel electrodes, such as this, and an oxidant electrode, direct current power is generated because the three-phase zone of the gaseous phase (fuel gas or oxidant gas), the liquid phase (solid polymer electrolyte), and solid phase (catalyst which a fuel electrode and an oxidant electrode have) is formed and the electrochemical reaction which carries out the account of following arises. That is, the reaction by (1) type arises in a fuel electrode.
[0004]
[Formula 1]
$H_2 \rightarrow 2H^+ + 2e^-$ ..... (1)
The reaction by (2) types arises in the oxidant electrode side.
[0005]
[Formula 2]
$(1/2)\ O_2 + 2H^+ + 2e^- \rightarrow H_2O$ .... (2)
The H^+ ion (proton) generated with the fuel electrode as a result of this reaction, e^- (electron) which moved toward the oxidant electrode in the inside of PE film, and was generated with the fuel electrode passes along the load which was connected between the fuel electrode and the oxidant electrode and which is not illustrated, and moves to an oxidant electrode from a fuel electrode. On the other hand, in an oxidant electrode, the oxygen contained in oxidant gas, the H^+ ion which has moved from the fuel electrode in the inside of PE film, and e^- which has moved through load react, and water (H_2O) is generated.
[0006]Drawing 6 is a side sectional view of an important section showing typically the unit fuel cell of the general example which performs the above mentioned operation with which a solid polyelectrolyte type fuel cell is provided in the state where it developed.
Drawing 7 is the perspective view typically shown where the unit fuel cell shown in drawing 6 is developed, and drawing 8 is the figure which looked at the separator which a unit fuel cell has from the direction of P arrow in drawing 6.

[0007]In drawing 6 - drawing 8, 6 is the unit fuel cell (it may be henceforth called a cell for

short.) which comprised the fuel cell cell 7 and the separators 61 and 62 which made counter each of the both principal planes, and have been arranged. The fuel cell cell 7 comprised the PE film 7C as an electrolyte layer, the fuel electrode 7A, and the oxidant electrode 7B, and is provided with the function to generate direct current power by the above mentioned place. The PE film 7C is 0.1. [mm] It will havc a width dimension of a grade, and an outside dimension of a larger plane direction than the outside dimension of the plane direction of the electrode layers 7A and 7B, and the exposed surface of the PE film 7C will exist [therefore] in the periphery of the electrode layers 7A and 7B between the ends of the PE film 7C.

[0008]The fuel electrode 7A is an electrode which is close to one principal surface of the PE film 7C, is laminated, and receives supply of fuel gas. The oxidant electrode 7B is an electrode which is close to the principal surface of another side of the PE film 7C, is laminated, and receives supply of oxidant gas. The lateral surface of the fuel electrode 7A is one side 7a of the fuel cell cell 7, and the lateral surface of the oxidant electrode 7B is the side 7b of another side of the fuel cell cell 7. As for both the fuel electrode 7A and the oxidant electrode 7B, it is general for it to be had and constituted and to stick with a hotpress the catalyst bed and electrode substrate containing a catalyst active material to the both principal planes of the PE film 7C by the aforementioned catalyst bed side. An electrode substrate supports a catalyst bed, it supplies and discharges reactant gas (there is what fuel gas and oxidant gas are named generically and said in this way henceforth.), and it is a sheet (as the material of construction, carbon paper is used, for example.) of the porosity which has a function as a charge collector. The catalyst bed is formed from the fluoro-resin which has a platinum catalyst of minute particle state, and water repellence in many cases.

And it is considered so that it can contact in a large area to reactant gas by much fine pores being formed in a layer.

Then, in many cases, the width dimension of the fuel cell cell 7 which set the fuel electrode 7A, the PE film 7C, and the oxidant electrode 7B is 1. [mm] It is an order grade.

[0009]By the way, the through hole 71 currently formed in the exposed surface of the PE film 7C is made to counter the through holes 615A and 616A provided in the separator 61, and the through holes 625A and 626A provided in the separator 62, and is formed.

It is a hole which makes a part of flowing path of reactant gas.

The through hole 72 currently similarly formed in the exposed surface of the PE film 7C is made to counter the through holes 613B and 614B provided in the separator 61, and the through holes 623B and 624B provided in the separator 62, and is formed.

It is a hole which makes a part of flowing path of the fluid 99 for cooling which carries out a postscript.

[0010]By the way, in the fuel cell cell 7, since this reaction is an exoergic reaction when generating direct current power according to the electrochemical reaction shown in the above mentioned (1) type and (2) types, it is not avoided that the heat of an equivalent value occurs mostly with the direct-current-power value generated, either. For this reason, the separator 61 and the separator 62, Reactant gas is supplied to the fuel cell cell 7, and the duty which removes the heat generated in the fuel cell cell 7 with extraction from the fuel cell cell 7 of the direct current power generated in the fuel cell cell 7 and generating of direct current power from the fuel cell cell 7 is borne.

[0011]Make the side 61a close to the side 7a of the fuel cell cell 7, and the separator 62 makes the side 62a close to the side 7b of the fuel cell cell 7, and as the separator 61 sandwiches the fuel

cell cell 7, respectively, it is allocated. Neither of separators 61 and 62 penetrate gas, but are manufactured using the material (for example, they are carbon, metal, etc.) moreover provided with good thermal conductivity and good electrical conductivity.
[0012]The separators 61 and 62 are equipped with the slot for gas conduction as a means to supply reactant gas to the fuel cell cell 7, respectively. Namely, the separator 61 carries out conduction of the fuel gas to the side 61a side adjacent to the side 7a of the fuel cell cell 7, and. The concave slot (slot for gas conduction) 611A which established the interval for discharging the fuel gas containing unconsumed hydrogen, and were provided, and the convex septum 612A of each other which intervenes between this slot 611A are formed by turns. The separator 62 carries out conduction of the oxidant gas to the side 62a side adjacent to the side 7b of the fuel cell cell 7, and. The concave slot (slot for gas conduction) 621A which established the interval for discharging the oxidant gas containing unconsumed oxygen, and were provided, and the convex septum 622A of each other which intervenes between this slot 621A are formed by turns. The crowning of the convex septa 612A and 622A is formed, respectively so that it may become the same field as each side 61a and 62a of the separators 61 and 62.
[0013]The slots 621A, such as this, become parallel mutually, and the both ends of each slot 621A formed in the separator 62 are opened for free passage by the slots 624A and 624A. One pair of through holes 625A and 625A which carry out an opening to the side 62b side used as an opposite hand are formed in the end of these slots 624A and 624A in the side 62a. One pair of through holes 626A and 626A which connect the side 62a and the side 62b to the separator 62 are formed in the part which serves as the through holes 625A and 625A with the physical relationship of tucking up its sleeves with a cord mutually. The slot 621A, the slot 624A, and the through hole 625A constitute the gas conduction way for carrying out conduction of the oxidant gas in the separator 62.
[0014]The through holes 615A and 615A and the through holes 616A and 616A are formed also in the separator 61. That is, the slots 611A, such as this, become parallel mutually, and the both ends of each slot 611A of the separator 61 are opened for free passage by the slot on the shape as well as the slots 624A and 624A in the case of the separator 62. The opening of the through holes 615A and 615A is carried out to the side [in which the side 61a serves as an opposite hand] 61b side from the end of this slot (it is a slot on the shape like 624A.). As the through holes 616A and 616A connect the side 61a and the side 61b and show them in drawing 7 (a), one pair of through holes 615A and 615A are formed in the part which serves as physical relationship of tucking up its sleeves with a cord mutually. The slot 611A, the aforementioned slot (it is a slot on the shape like 624A.), and the through hole 615A constitute the gas conduction way for carrying out conduction of the fuel gas in the separator 61.
[0015]73 is a gas-seal object made from an elastic material (for example, it is an O ring.) which undertakes the duty which prevents the reactant gas which carries out conduction of the inside of the above mentioned gas conduction way from leaking and coming outside a gas conduction way. The gas-seal object 73 is stored and arranged like the slots 611A and 624A of each separator 61 and 62 all over the slot on the shape, and the slot 619,629 of the concave shape formed in the edge part of the part in which the slots 621A and 624A were formed. Although illustrating omitted, Each opening to the side 61b of the through holes 615A and 616A which the separator 61 has, Each opening to the side 62b of the through holes 625A and 626A which surround each opening to the side 61a of 616A, and the separator 62 has, Each opening to the side 62a of 626A is surrounded, and the slot of the concave shape for storing the gas-seal object made from an elastic material (for example, it is an O ring.) which undertakes the duty which

prevents reactant gas from leaking and coming from this part outside a gas conduction way is formed.

[0016]The separators 61 and 62 are equipped with the slot which carries out conduction of the fluid 99 for cooling as a cooling unit for removing the heat generated in the fuel cell cell 7 from the fuel cell cell 7. That is, the two concave slots (slot for the conduction of the fluid 99 for cooling) 621B where the separator 62 makes the side 62b carry out conduction of the fluid 99 for cooling are formed. One pair of through holes 623B and 624B which carry out an opening to the side 62a are formed in the both ends of each slot 621B. Each slot 621B and the through holes 623B and 624B constitute the cooling unit to which conduction of the fluid 99 for cooling in the separator 62 is carried out. The two concave slots (slot for the conduction of the fluid 99 for cooling) 611B which make the side 61b carry out conduction of the fluid 99 for cooling are formed in the separator 61 like the separator 62. One pair of through holes 613B and 614B which carry out an opening to the side 61a are formed in the both ends of each slot 611B. Each slot 611B and the through holes 613B and 614B constitute the cooling unit to which conduction of the fluid 99 for cooling in the separator 61 is carried out.

[0017]Each slot 611B and 621B is surrounded in the side 61b of the separator 61, and the side 62b of the separator 62, and the slots 618B and 628B on the concave shape are formed in them, respectively. The slot of concave shape, such as this, is for storing the seal body (for example, it is an O ring.) of the product made from an elastic material for preventing the fluid 99 for cooling leaking and coming out. Although illustrating omitted, Each opening to the side 61a of the through holes 613B and 614B which the separator 61 has is surrounded, Each opening to the side 62a of the through holes 623B and 624B which the separator 62 has is surrounded, The slot of the concave shape for storing the seal body made from an elastic material (for example, it is an O ring.) which undertakes the duty with which the fluid 99 for cooling prevents leaking and coming from this part out of a cooling unit is formed.

[0018]The voltage which the one fuel cell cell 7 generates is 1. [V]the cell 6 which has said composition carried out since it is below a grade and a low value -- two or more (they are hundreds of pieces from tens of pieces in many cases.) -- it is general that constitute as a layered product of the cell laminated so that the series connection of the generated voltage of the fuel cell cell 7 might be carried out mutually, raise voltage, and practical use is presented. Drawing 9 is a lineblock diagram of an important section showing typically the solid polyelectrolyte type fuel cell of a conventional example, and (a) is the side view.

(b) is the plan.

Drawing 10 is an explanatory view explaining the flowing path of the fluid for cooling given to the solid polyelectrolyte type fuel cell shown in drawing 9. Into drawing 9, only typical numerals were described about the numerals attached by drawing 6 - drawing 8.

[0019]In drawing 9, 9 is the solid polyelectrolyte type fuel cell (it may be henceforth called a stack for short.) which was constituted by laminating the cell 6 of plurality (the case where the number of the cell 6 was eight pieces was illustrated in drawing 9.) and which made the layered product of the cell 6 the subject. The collecting electrode plates 91 and 91 of the product made from conducting materials, such as a copper material, for the stack 9 to take out the direct current power generated with the cell 6 to the both ends of the layered product of the cell 6 from the stack 9, The electrical insulation boards 92 and 92 made from the electric insulation material for insulating the cell 6 and the collecting electrode plate 91 from a structure electrically, The metal pressure plates 93 and 94, such as iron material allocated in each lateral-surface side of both the electrical insulation boards 92, are laminated one by one, and the both-outsides side sides are

consisted of as moderate welding pressure is given to the pressure plates 93 and 94 with two or more clamping bolts 95.
[0020]In the cell 6 which adjoins mutually, the through hole 615A formed in the separator 61, and the through hole 626A formed in the separator 62, The through hole 616A formed in the separator 61 and the through hole 625A formed in the separator 62 make the opening part agree mutually, and is formed. The through hole which is not illustrated, respectively is formed in the through holes 615A and 616A with which the separator 61 of the collecting electrode plate 91, the electrical insulation board 92, and the pressure plate 93 is provided, and the part which counters. The through holes 625A and 626A with which the separator 62 of the collecting electrode plate 91, the electrical insulation board 92, and the pressure plate 94 is provided, and the through hole which is not illustrated to the part which counters, respectively are formed. The gas conduction way for fuel gas and the gas conduction way for oxidant gas which all the cells 6 have in each by this etc. when laminating two or more cells 6 form the gas conduction way which each opened for free passage mutually.
[0021]The through hole 613B formed in the separator 61 in the cell 6 which adjoins mutually and the through hole 623B formed in the separator 62, The through hole 614B formed in the separator 61 and the through hole 624B formed in the separator 62 make the opening part agree mutually, and is formed. The through hole almost of the same shape as the through hole 613B which is not illustrated is formed in each through hole 613B with which the separator 61 of the collecting electrode plate 91, the electrical insulation board 92, and the pressure plate 93 is provided, and the part which counters, respectively. Then, the side used as the lateral surface of the stack 9 of the pressure plate 93 is made to counter each through hole, and is equipped with the piping connection object 98 for fluid 99 for cooling. A through hole is surrounded to each of the opening of the through hole of the both side surfaces of the electrical insulation board 92, and the opening of a through hole of the side in which it is equipped with the piping connection object 98 of the pressure plate 93, and the slot on the concave shape is formed in it. Each slot is equipped with the seal body made from an elastic material (for example, it is an O ring.) which undertakes the duty with which the fluid 99 for cooling prevents leaking and coming from parts, such as this, out of a cooling unit and which is not illustrated. Each slot 618B currently formed in the separator 61 is also equipped with the seal body which is not illustrated.
[0022]Each through hole 624B with which the separator 62 of the collecting electrode plate 91, the electrical insulation board 92, and the pressure plate 94 is provided, the through hole which is not illustrated to the part which counters as well as the case of the collecting electrode plate 91, the electrical insulation board 92, and the pressure plate 93, and the slot are formed. The side used as the lateral surface of the stack 9 of the pressure plate 94 is made to counter each through hole, and is equipped with the piping connection object 98 for fluid 99 for cooling. Each slot is equipped with the seal body which the seal body which is not illustrated does not illustrate into each slot 628B currently formed in the separator 62 again, either. In this way, when laminating two or more cells 6, as the flowing path of the fluid 99 for cooling which cell 6 grade has in each was shown in drawing 10, it will be mutually open for free passage, and it will be constituted.
[0023]As a result, while was formed in the separator 61 which the cell 6 with which while the pressure plate 93 was equipped adjoins the collecting electrode plate 91 via the piping connection object 98 (it has written with the "entrance" in addition into drawing 10.) etc. has, and the fluid 99 for cooling flows into the slot 611B first. Then, it shunts and flows in the slot 611B and 621B via [each cell 6 has] the through holes 613B and 623B, and via the through holes 614B and 624B etc., the pressure plate 94 was equipped with while and it once flows out of the

piping connection object 98 into the exterior of the stack 9. This fluid 99 for cooling that flowed out flows in the piping 97, and flows in in the stack 9 again from the piping connection object 98 of another side with which the pressure plate 94 was equipped. This fluid 99 for cooling flows into the slot 621B of another side formed in the separator 62 which the cell 6 contiguous to the collecting electrode plate 91 has first. Shunt and flow in the slot 611B of another side which each cell 6 has via the through holes 614B and 624B, and 621B, and then, via the through holes 613B and 623B etc., It will be discharged by the exterior of the stack 9 from the piping connection object 98 (it has written with the "exit" in addition into drawing 10.) of another side with which the pressure plate 93 was equipped.

[0024]The clamping bolt 95 is a hexagon head bolt etc. with which it is equipped ranging over the pressure plates 93 and 94, and each clamping bolt 95 pressurizes the cell 6 in the laminating direction in cooperation with this, etc. the hex nut inserted in, etc. the belleville spring for giving the stable welding pressure, etc. This clamping bolt 95 is per surface area of the appearance of the fuel cell cell 7, and the welding pressure which pressurizes the cell 6 is 5. [kg/cm^2] It is general that it is an inside-and-outside grade.

[0025]In the stack 9 constituted in this way, reactant gas flows from the upper part toward the bottom in the slot 611A for gas conduction formed in each separator 61 and 62, and 621A to a gravity direction to a gravity direction, as the arrow showed in drawing 9 (a). And reactant gas will be supplied to parallel about two or more cells 6, respectively. Then, since it is a film which functions as a good proton conductivity electrolyte by making saturation carry out water for getting having mentioned above the PE film 7C currently used for the fuel cell cell 7, reactant gas is humidified and adjusted by the humidity state of a moderate value, and is supplied to it at the stack 9.

[0026]In order to remove the above mentioned heat generated in the fuel cell cell 7 which the cell 6 has, the stack 9 is supplied the fluid 99 for cooling which is a city water, for example. In the cell 6, the fuel cell cell 7 is cooled via the separators 61 and 62 by this fluid 99 for cooling carrying out conduction, as the inside of each slot 611B formed in the separators 61 and 62 and 621B was already explained using drawing 10 etc. Thereby, the fuel cell cell 7 is 70. [**] ** et al. [80] [**] Being operated by the temperature conditions of a grade is general.

[0027]For example, the number of the slots 611B and 621B established in a separator is made to correspond to some, such as a direct-current-power value generated in the one fuel cell cell 7, and the proper number is chosen.

Therefore, what equips a separator with the four slots 611B and 621B, respectively is known.

Plan **** which shows the composition of the important section which showed typically the solid polyelectrolyte type fuel cell of a different conventional example using the unit fuel cell with which drawing 11 was provided with such a separator. Drawing 12 is the figure which looked at the separator used in drawing 11 from the direction of Q arrow in drawing 11. In drawing 11 and drawing 12, the same numerals are given to identical parts and the explanation is abbreviated to the unit fuel cell for the solid polyelectrolyte type fuel cells of the general example shown in drawing 6 - drawing 8, and the solid polyelectrolyte type fuel cell of the conventional example shown in drawing 9. Into drawing 11, only typical numerals were described about the numerals attached by drawing 6 - drawing 9, and drawing 12.

[0028]As opposed to the stack 9 of the conventional example which showed drawing 9 9A in drawing 11 and drawing 12, It changes to the unit fuel cell 6, the collecting electrode plate 91, the electrical insulation board 92, and the pressure plates 93 and 94, and is a unit fuel cell (henceforth). It may be called a cell for short. It is the solid polyelectrolyte type fuel cell (it may

be henceforth called a stack for short.) which used 6A, the collecting electrode plate 91A, the electrical insulation board 92A, and the pressure plates 93A and 94A. He changes the cell 6A to the separators 61 and 62 and the fuel cell cell 7, and is trying to use the separators 61A and 62A and the fuel cell cell 8 for it to the cell 6 shown in drawing 6 - drawing 8. Having the four slots 611B and 621B is carrying out difference of the separator 61A and the separator 62A to the separator 61 and the separator 62, respectively. When each of the slots 611B and 621B, such as this, was classified, as it illustrated about the slot 621B in drawing 12, it is $_{(A)}$ to the numerals 611B or 621B... The suffix of $_{(D)}$ will be attached.

[0029]That the number of the slots 611B and 621B and the same number are provided with four pairs (therefore, they are a total of eight pieces.) of through holes 72 formed in PE film which is not illustrated to the fuel cell cell 7 is carrying out difference of the fuel cell cell 8. As shown in drawing 11, the pressure plates 93A and 94A are provided with the four piping connection objects 98 to the pressure plates 93 and 94, respectively. The pressure plate 93A, the collecting electrode plate 91A, and the electrical insulation board 92A, To the pressure plate 93, the collecting electrode plate 91, and the electrical insulation board 92 to each through hole 613B with which the separator 61A is provided, and the part which counters. That each through hole 624B with which the separator 62A is provided, and the through hole which is not illustrated to the part which counters, respectively are formed to the pressure plate 94, the collecting electrode plate 91, and the electrical insulation board 92 is carrying out difference of the pressure plate 94A, the collecting electrode plate 91A, and the electrical insulation board 92A.

[0030]For this reason, fundamentally, the conduction course of the fluid 99 for cooling in the stack 9A is the same as the conduction course of the fluid 99 for cooling in the explained stack 9 using drawing 10 etc. The fluid 99 for cooling in the stack 9A is the course which used the dashed dotted line and the arrow and illustrated the main course in drawing 11, and carries out conduction of the inside of the stack 9A. That is, the fluid 99 for cooling flows into the stack 9A from the piping connection object 98 (it has written with the "entrance" in addition into drawing 11.) with which the pressure plate 93A is equipped. Then, it flows into the layered product of a cell via the through hole 613B currently formed in slot $611B_A$, and each through hole of the pressure plate 93A currently formed in the part which counters, the collecting electrode plate 91A, and the electrical insulation board 92A, It shunts and flows in slot $611B_A$ which each cell 6A has, and $621B_A$, carrying out conduction of the inside of the through hole 613B relevant to slot $611B_A$ and $621B_A$, and 72,623B. Then, the through holes 614B and 72,624B relevant to slot $611B_A$ and $621B_A$, And it once flows into the exterior of the stack 9 out of the piping connection object 98 with which the pressure plate 94A was equipped via the through hole 624B currently formed in slot $621B_A$, and each through hole of the collecting electrode plate 91A, the electrical insulation board 92A, and the pressure plate 94A which are formed in the part which counters.

[0031]This fluid 99 for cooling that flowed out flows in the piping 97, and flows into the stack 9A again from the piping connection object 98 with which the pressure plate 94A was equipped. This fluid 99 for cooling flows into slot $621B_B$ which the cell 6A contiguous to the collecting electrode plate 91A has and which was formed in the separator 62A first. Then, it shunts and flows in slot $611B_B$, slot $611B_B$ which each cell 6A has via the through holes 614B and 72,624B relevant to $621B_B$, and $621B_B$, The through holes 613B and 72,623B relevant to slot $611B_B$ and $621B_B$, And it flows into the exterior of the stack 9 out of the piping connection object 98 with which the pressure plate 93A was equipped via the through hole 613B currently formed in slot $611B_B$, and each through hole of the collecting electrode plate 91A, the electrical insulation board 92A, and the pressure plate 93A which are formed in the part which counters. Henceforth,

the through holes 613B and 72,623B eventually relevant to [repeat this procedure and] slot $611B_D$ and $621B_D$, And via the through hole 613B currently formed in slot $611B_B$, and each through hole of the collecting electrode plate 91A, the electrical insulation board 92A, and the pressure plate 93A which are formed in the part which counters, It will be discharged by the exterior of the stack 9 from the piping connection object 98 (it has written with the "exit" in addition into drawing 11.) with which the pressure plate 93A was equipped.

[0032]The stack provided with the cooling body for exclusive use is also known using [instead] the separator with which it does not have as a cell the slot which carries out conduction of the fluid 99 for cooling again. In this case, it is general to supply the fluid 99 for cooling to a cooling body via proper piping.

[0033]

[Problem(s) to be Solved by the Invention]In the solid polyelectrolyte type fuel cell by the conventional technology mentioned above, although it is cooled with the fluid 99 for cooling via a separator etc., and fuel cell cell 7 grade is held for operation of a stack at optimal temperature and fully exhibits the function of direct-current power generation, there is a problem which carries out the account of following. Namely, in the stacks 9 and 9A by conventional technology, etc., It is that there is a fact [illustrated / to drawing 13 / distribution of laminating directions of the temperature of fuel cell cell 7 grade which each cell 6 and 6A has, such as the cells 6 and 6A,] that it is high in the center section of the laminating direction, and low at the both ends of a laminating direction. Drawing 13 is a graph which shows the example of measurement of the temperature distribution of the central part in the area direction of the fuel cell cell which each unit fuel cell has in the unit fuel cell laminating direction of the solid polyelectrolyte type fuel cell of a conventional example here.

[0034]In the fuel cell cell 7 which became a high temperature because the temperature distribution in a cell laminating direction is not uniform, and 8 grades, since evaporation of water is promoted, the fuel cell cell 7, the PE film 7C currently used for 8 grades, etc. are dried. On the other hand, in the fuel cell cell 7 from which the temperature distribution in a cell laminating direction became a low temperature because it is not uniform, and 8 grades, the degree which moisture solidifies on the surface becomes high by the amount of evaporation of water being reduced with the fuel cell cell 7, the fuel electrode 7A currently used for 8 grades, and the oxidant electrode 7B.

[0035]The resistivity value increases with the characteristic character which PE film which mentioned above the dry PE film 7C has. Since the electric resistance value of PE film will increase if the resistivity value of PE film increases as a result, the loss by Joulian heat in the fuel cell cell 7 and 8 grades will increase, and the generation efficiency will fall. In the fuel electrode 7A and the oxidant electrode 7B in which the surface was covered with water, that power generation performance will fall by it being impregnated with this water into an electrode, and checking the diffusion in the electrode of reactant gas.

[0036]The heterogeneity of the temperature distribution in the laminating direction of the cell which brings about the performance degradation of stacks, such as this, In the both ends of the laminating direction of the cell in the stacks 9 and 9A etc. It is equipped with the collecting electrode plates 91 and 91A, the pressure plates 93 and 93A, the pressure plates 94 and 94A, etc., When the cell using the separator with which it has the slot which carries out conduction of the fluid 99 for cooling as a cell is adopted, The cooling unit formed in the separator by the side of the collecting electrode plate which the cell allocated in the both ends of a stack has originates in having only one fuel cell cell etc. as a fuel cell cell of a cooling object. That is, conducting

materials used for the collecting electrode plates 91 and 91A, such as a copper material, are also the good conductors of heat. Although metallic materials, such as iron material, are used in consideration of a mechanical strength as for the pressure plates 93, 93A, 94, and 94A, metallic materials, such as this, are also the good conductors of heat. Since existence of thermal conductors, such as this, makes the amount of heat leakage from this part increase, the temperature of both ends, such as the stacks 9 and 9A, falls. The temperature of fuel cell cells, such as this, falls because the degree cooled with the separator which cools only one fuel cell cell as compared with the fuel cell cell allocated in other parts in the fuel cell cell which the cell allocated in the both ends which have one side cooled has becomes large.
[0037]this invention is made in view of the problem of the above-mentioned conventional technology, and comes out. The purpose has equalization of distribution of the temperature in the laminating direction of a fuel cell in the easy thing for which a solid polyelectrolyte type fuel cell is provided.

[0038]
[Means for Solving the Problem]A fuel cell cell in which the above-mentioned purpose generates direct current power in response to supply of 1 fuel gas and oxidant gas in this invention, One pair of separators with which a gas conduction slot for making each of both principal planes of a fuel cell cell counter, being arranged, and supplying fuel gas or oxidant gas to a fuel cell cell is formed, Have two or more ****** unit fuel cells, and unit fuel cells, such as this, Make the side by the side of an anti-gas conduction slot of the separator counter the side by the side of an anti-gas conduction slot of a separator which a unit fuel cell which adjoins each other mutually has, and a layered product of an adjacent unit fuel cell and a unit fuel cell laminated mutually is made, A collecting electrode plate made from a conducting material contacted by lateral surface of a separator of a layered product of this unit fuel cell located in both terminals at least, An electrical insulation board made from an electric insulation material contacted by lateral surface of a collecting electrode plate located in a both-ends tail of a layered product of a unit fuel cell at least of collecting electrode plates, such as this, A pressure plate which gives welding pressure which is contacted by lateral surface of an electrical insulation board located in a both-ends tail of a layered product of a unit fuel cell at least of electrical insulation boards, such as this, and pressurizes a layered product of a unit fuel cell, a collecting electrode plate, and an electrical insulation board in laminating directions, such as this, It has a piping connection object for fluids for cooling installed in a part which supplies a fluid for cooling from which heat generated in a fuel cell cell is removed, and a part to discharge, A fluid for cooling from which heat generated in a fuel cell cell is removed, . After being supplied from the outside of a layered product of a unit fuel cell via a piping connection object for supply sides of a fluid for cooling and cooling a unit fuel cell, it is what is discharged by the exterior of a layered product of a unit fuel cell via a piping connection object for the discharge sides of a fluid for cooling. In a solid polyelectrolyte type fuel cell, to a part of a collecting electrode plate contacted by lateral surface of a separator of a layered product of a unit fuel cell located in both terminals at least. It has composition in which it comes to form a heating element heated by current which a solid polyelectrolyte type fuel cell outputs, Or a heating element formed in a part of a collecting electrode plate in a means given in 2 aforementioned 1 paragraph, It has composition which is a heating element of being laminated and a product made from electrical resistance materials ****(ed) between a layered product of a unit fuel cell, and a collecting electrode plate, Or a fuel cell cell which generates direct current power in response to supply of considering a heating element formed in a part of a

collecting electrode plate in a means given in 3 aforementioned 1 paragraph as composition which is a collecting electrode plate made from electrical resistance materials or 4 fuel gas, and oxidant gas, One pair of separators with which a gas conduction slot for making each of both principal planes of a fuel cell cell counter, being arranged, and supplying fuel gas or oxidant gas to a fuel cell cell is formed, Have two or more ****** unit fuel cells, and unit fuel cells, such as this, Make the side by the side of an anti-gas conduction slot of the separator counter the side by the side of an anti-gas conduction slot of a separator which a unit fuel cell which adjoins each other mutually has, and a layered product of an adjacent unit fuel cell and a unit fuel cell laminated mutually is made, A collecting electrode plate made from a conducting material contacted by lateral surface of a separator of a layered product of this unit fuel cell located in both terminals at least, An electrical insulation board made from an electric insulation material contacted by lateral surface of a collecting electrode plate located in a both-ends tail of a layered product of a unit fuel cell at least of collecting electrode plates, such as this, A pressure plate which gives welding pressure which is contacted by lateral surface of an electrical insulation board located in a both-ends tail of a layered product of a unit fuel cell at least of electrical insulation boards, such as this, and pressurizes a layered product of a unit fuel cell, a collecting electrode plate, and an electrical insulation board in laminating directions, such as this, A fluid for cooling from which heat which was provided with a piping connection object for fluids for cooling installed in a part which supplies a fluid for cooling from which heat generated in a fuel cell cell is removed, and a part to discharge, and was generated in a fuel cell cell is removed, . After being supplied from the outside of a layered product of a unit fuel cell via a piping connection object for supply sides of a fluid for cooling and cooling a unit fuel cell, it is what is discharged by the exterior of a layered product of a unit fuel cell via a piping connection object for the discharge sides of a fluid for cooling. In a solid polyelectrolyte type fuel cell, a collecting electrode plate to having composition provided with a heating unit heated by a fluid for cooling in which temperature rose by cooling a unit fuel cell, and a pan. Or a heating unit with which a collecting electrode plate equips 5 aforementioned 4 paragraph in a means of a statement is formed in a collecting electrode plate, and is attained more, without temperature considering a fluid for cooling which went up as composition which is a flowing path for fluids for cooling which carries out conduction by cooling a unit fuel cell.

[0039]

[Function]In this invention, in a solid polyelectrolyte type fuel cell (stack) to the part of the collecting electrode plate contacted by the lateral surface of the separator of the layered product of (1) unit fuel cell (cell) located in both terminals at least. For example, it has composition in which it comes to form the heating element heated by the current which stacks, such as a heating element of being laminated and the product made from electrical resistance materials ****(ed) between the layered product of a cell and a collecting electrode plate, output.

Therefore, conduction of the current outputted from a stack will be carried out to a heating element, and the Joule heat of the value proportional to the product of the electric resistance value which a heating element has in a heating element for this reason, and the square value of the current value by which conduction is carried out to a heating element occurs.

A thing, such as making the value of the Joule heat generated with this heating element into the value corresponding to the quantity of heat diffused from the end of the laminating direction of the cell of a stack, enables it to attain equalization of distribution of the temperature in the laminating direction of a cell.

[0040](2) By considering the heating element formed in the part of a collecting electrode plate in

the aforementioned (1) paragraph as the composition which is a collecting electrode plate made from electrical resistance materials, Since conduction of the current outputted from a stack is carried out to a collecting electrode plate, the Joule heat of the value proportional to the product of the electric resistance value which a collecting electrode plate has in a collecting electrode plate, and the square value of the current value by which conduction is carried out to a collecting electrode plate occurs. A thing, such as making the value of the Joule heat generated from this collecting electrode plate into the value corresponding to the quantity of heat diffused from the end of the laminating direction of the cell of a stack, enables it to attain equalization of distribution of the temperature in the laminating direction of a cell like the case of the aforementioned (1) paragraph.

(3) This invention is 10 by the case where the fluid for cooling which cools a stack carries out a rise in heat by cooling a stack, and that temperature rise value is a stack of a conventional example. [**] It notes recognizing grade existence. . Namely, a collecting electrode plate is heated by the fluid for cooling in which temperature rose by cooling a cell. For example, it will be formed in a collecting electrode plate and a collecting electrode plate will be positively heated with the fluid for cooling in which temperature rose via the heating unit by having composition provided with a heating unit, such as being in the flowing path for the fluids for cooling which carries out conduction of the fluid for cooling in which temperature rose by cooling a cell. A thing, such as making heating quantity of the collecting electrode plate heated with the fluid for cooling in which this temperature rose into the value corresponding to the quantity of heat diffused from the end of the laminating direction of the cell of a stack, enables it to attain equalization of distribution of the temperature in the laminating direction of a cell.

[0041]

[Example]The example of this invention is described in detail with reference to drawings below. Example 1; drawing 1 is that plan showing typically the composition of the important section of the solid polyelectrolyte type fuel cell by one example of this invention corresponding to claims 1 and 2. In drawing 1, the same numerals are given to the solid polyelectrolyte type fuel cell and identical parts by the conventional example shown in drawing 9 etc., and the explanation is omitted. Into drawing 1, only typical numerals were described about the numerals attached by drawing 6 - drawing 10. In drawing 1, 1 to the solid polyelectrolyte type fuel cell 9 by the conventional example shown in drawing 9 etc. between each collecting electrode plate 91 and the cell 6 which adjoins this collecting electrode plate 91, It is a solid polyelectrolyte type fuel cell (it may be henceforth called a stack for short.) which comes to **** the laminated heating element 2. The heating element 2 is an alloy for electric heat (the volume resistivity value is 1.0-1.5). [muomegam] it is a grade. etc. -- the sheet metal made from electrical resistance materials being formed in an area equivalent to the area direction size which the fuel electrode 7A and the oxidant electrode 7B have, and the thickness of the heating element 2, It is preferred that it is determined that the value of the Joule heat generated in the heating element 2 by the current outputted from the stack 1 turns into a value corresponding to the quantity of heat diffused from the end of the laminating direction of the stack 1.

[0042]Since it had the above-mentioned composition in the example shown in drawing 1, conduction of the current outputted to each heating element 2 from the stack 1 will be carried out to the thickness direction. For this reason, the Joule heat of the value proportional to the product of the electric resistance value which the heating element 2 has, and the square value of the current value outputted from the stack 1 occurs in the heating element 2, and the heating element 2 functions on it as an electric heating unit. The value of this Joule heat generated from the

heating element 2, Since it is the value which balanced mostly the quantity of heat diffused from the end of the laminating direction of the cell 6 of the stack 1 from the above mentioned electric resistance value which the heating element 2 has, The quantity of heat diffused from the end of the laminating direction of the cell 6 of the stack 1 and the value of the Joule heat generated with each heating element 2 will be offset mostly. Therefore, in the stack 1, the temperature of the fuel cell cell 7 which each cell 6 has becomes possible [using the same value mostly in the laminating direction of the cell 6]. Then, there is also an advantage that there is no necessity of preparing separately the power supply for the electric heating units for equalizing the temperature distribution in the laminating direction of the cell 6 by the ability of the output current of the stack 1 which carries out conduction of the inside of the stack 1 to be used.

[0043]Example 2; drawing 2 is that plan showing typically the composition of the important section of the solid polyelectrolyte type fuel cell by one example of this invention corresponding to claims 1 and 3. In drawing 2, the same numerals are given to the solid polyelectrolyte type fuel cell and identical parts by the conventional example shown in drawing 9 etc., and the explanation is omitted. Into drawing 2, only typical numerals were described about the numerals attached by drawing 6 - drawing 10. In drawing 2, 1A is the solid polyelectrolyte type fuel cell (it may be henceforth called a stack for short.) which changes to the collecting electrode plate 91 and used the collecting electrode plate 3 to the solid polyelectrolyte type fuel cell 9 by the conventional example shown in drawing 9 etc. The collecting electrode plate 3 is an alloy for electric heat (the volume resistivity value is 1.0-1.5). [muomegam] it is a grade. etc. -- it is manufactured using electrical resistance materials. As for the electric resistance value of the collecting electrode plate 3, it is preferred that it is determined that the value of the Joule heat generated in the collecting electrode plate 3 by the current outputted from the stack 1A turns into a value corresponding to the quantity of heat diffused from the end of the laminating direction of the stack 1A.

[0044]Since it had the above-mentioned composition in the example shown in drawing 2, conduction of the current outputted from the stack 1A will be carried out to each collecting electrode plate 3. For this reason, the Joule heat of the value proportional to the product of the electric resistance value which the collecting electrode plate 3 has, and the square value of the current value outputted from the stack 1A occurs in the collecting electrode plate 3, and the collecting electrode plate 3 functions on it also as an electric heating unit. The value of this Joule heat generated from the collecting electrode plate 3, Since it is the value which balanced mostly the quantity of heat diffused from the end of the laminating direction of the cell 6 of the stack 1A from the above mentioned electric resistance value which the collecting electrode plate 3 has, The quantity of heat diffused from the end of the laminating direction of the cell 6 of the stack 1A and the value of the Joule heat generated with each collecting electrode plate 3 will be offset mostly. Therefore, in the stack 1A, the temperature of the fuel cell cell 7 which each cell 6 has becomes possible [using the same value mostly in the laminating direction of the cell 6]. Then, as compared with the stack 1 by Example 1, since the heating element 2 is unnecessary, the stack 1A by Example 2 does not increase part mark, and it has the advantage that it is possible to attain equalization for the temperature distribution in the laminating direction of the cell 6. The stack 1A also has the advantage that there is no necessity of preparing separately the power supply for the electric heating units for equalizing the temperature distribution in the laminating direction of the cell 6 by the ability of the output current of the stack 1A which carries out conduction of the inside of the stack 1A to be used like the case of the stack 1.

[0045]Example 3; drawing 3 is that plan showing typically the composition of the important

section of the solid polyelectrolyte type fuel cell by one example of this invention corresponding to claims 4 and 5. Drawing 4 is the figure seen from the direction [in / a part of (a) of a collecting electrode plate fractures, and / drawing 3] of R arrow while it was shown in drawing 3.
(b) is an A-A view figure in drawing 4 (a).
A part of (a) of the collecting electrode plate of another side which showed drawing 5 in drawing 3 is the figure which was fractured and was seen from the direction of S arrow in drawing 3.
(b) is a B-B view figure in drawing 5 (a).
In drawing 3, the same numerals are given to the collecting electrode plate and identical parts which are used for the solid polyelectrolyte type fuel cell by a different conventional example shown in drawing 11 etc., and the solid polyelectrolyte type fuel cell of a different conventional example shown in drawing 11, and the explanation is omitted. Into drawing 3, only typical numerals were described about the numerals attached by drawing 4 - drawing 12.
[0046]As opposed to the solid polyelectrolyte type fuel cell 9A by the conventional example which showed drawing 11 etc. 1B in drawing 3, It changes to the pressure plate 93A by the side of the "entrance" of the collecting electrode plate 91A and the fluid 99 for cooling, and an "exit", and the electrical insulation board 92A, Respectively, it is the solid polyelectrolyte type fuel cell (it may be henceforth called a stack for short.) which used the collecting electrode plate 4, the collecting electrode plate 5 and the pressure plate 93B, and the electrical insulation board 92B. Change the collecting electrode plate 4 to the breakthrough which stands in a row to the "exit" of the fluid 99 for cooling among the breakthroughs currently formed in each through hole 613B with which the separator 61A is provided, and the part which counters to the collecting electrode plate 91A, and have the closed-end hole 42, and. Having the closed-end hole 43 and the flowing path 44 of the fluid 99 for cooling which is a heating unit is carrying out difference. That is, the through hole 41 is formed in the through hole 613B currently formed in the slot 611B in which the separator 61A has the collecting electrode plate 4, and the part which counters. The through hole 613B by which through hole 41_A is formed in slot $611B_A$ among this through hole 41, Through hole 41_B is the through hole 613B currently formed in slot $611B_B$, and through hole 41_C is formed in each of the through hole 613B currently formed in slot $611B_C$, and the part which counters.
[0047]45 and 45 are through holes which make counter the through holes 615A and 616A by the side of a reactant gas inflow in the through hole 615A with which the separator 61A is provided, and 616A, and are formed. 46 is a terminal area for taking out the output current of the stack 1B. In order to make the clamping bolt 95 penetrate, it has the through hole 47 currently formed in the terminal area 46 if needed.
In order to equip with the connection body which takes out output current and which is not illustrated, it has the through hole 48 if needed.
The opening of the closed-end hole 42 is carried out to the side [in which it contacts the separator 61A for each other] 4a side.
The opening of the closed-end hole 43 is carried out to the side side of the opposite hand to the side 4a.
Both the closed-end holes 42 and 43 are connected within the collecting electrode plate 4, and the flowing path 44 of the fluid 99 for cooling is formed like the graphic display. This closed-end hole 42 is formed in the through hole 613B currently formed in slot $611B_D$ which the separator 61A has, and the part which counters.
[0048]The inside of the breakthrough currently formed in each through hole 624B which the

separator 62A equips with the collecting electrode plate 5 to the collecting electrode plate 91A, and the part which counters, Change to the breakthrough which stands in a row in slot $621B_D$ in which it changes to the breakthrough which stands in a row in slot $621B_C$ which the separator 62A has, and the separator 62A has the closed-end hole 52, and it has the closed-end hole 53, and having the flowing path 54 of the fluid 99 for cooling which is a heating unit is carrying out difference. That is, the through hole 51 is formed in the through hole 624B currently formed in the slot 621B in which the separator 62A has the collecting electrode plate 5, and the part which counters. The through hole 624B by which through hole 51_A is formed in slot $621B_A$, and through hole 51_B are formed in the through hole 624B currently formed in slot $621B_B$, and each and the part which counters among this through hole 51. 55 and 55 are through holes which make counter the through holes 625A and 626A by the side of a reactant gas outflow in the through hole 625A with which the separator 62A is provided, and 626A, and are formed. 56 is a terminal area for taking out the same output current of the stack 1B as the terminal area 46 which the collecting electrode plate 4 has. In order to make the clamping bolt 95 penetrate, it has the through hole 57 currently formed in the terminal area 56 if needed.
In order to equip with the connection body which takes out output current and which is not illustrated, it has the through hole 58 if needed.
The opening of both the closed-end hole 52 and the closed-end hole 53 is carried out to the side [in which it contacts the separator 62A for each other] 5a side, both the closed-end holes 52 and 53 are connected within the collecting electrode plate 5, and the flowing path 54 of the fluid 99 for cooling is formed like the graphic display.
[0049]That the breakthrough is formed in the closed-end hole 43 with which the collecting electrode plate 4 is provided, and the part which counters to the pressure plate 93A and the electrical insulation board 92A, respectively is carrying out difference of the pressure plate 93B and the electrical insulation board 92B. Then, the piping connection object 98 of the "exit" part of the fluid 99 for cooling is a part of this breakthrough with which the pressure plate 93B is provided, and the pressure plate 93B is equipped with it.
[0050]The conduction course of the fluid 99 for cooling in the stack 1B with the composition mentioned above, Conduction of the inside of the through hole 613B relevant to slot $611B_C621B_C$ which each cell 6A has, and 72,623B is carried out, Shunt the inside of each slot $611B_C$ and $621B_C$, and it is flowed through and done so, Conduction of the inside of the through hole 614B relevant to slot $611B_C$ and $621B_C$ and 72,624B is carried out, Till the place which flows out of the through hole 624B which slot $621B_C$ formed in the separator 62A with which the cell 6A contiguous to the collecting electrode plate 5 is provided has, it is completely the same as that of the conduction course of the fluid 99 for cooling in the stack 9A.
[0051]After the fluid 99 for cooling flowed out of the through hole 624B which slot $621B_C$ has in the stack 1B, conduction is carried out in the following course. That is, conduction of the inside of the flowing path 54 which the collecting electrode plate 5 has first from the closed-end hole 52 which the collecting electrode plate 5 has is carried out, and it flows into the layered product of a cell from the closed-end hole 53 which the collecting electrode plate 5 has via the through hole 624B which slot $621B_D$ formed in the separator 62A with which the cell 6A is provided has. Therefore, the piping connection object 98 and the piping 97 are unnecessary between them.
[0052]The fluid 99 for cooling which re-flowed into the layered product of the cell from the through hole 624B which slot $621B_D$ has, Like the case of the stack 9A, carrying out conduction of the inside of the through hole 624B relevant to slot $611B_D$ and $621B_D$, and 72,624B. Shunt the

inside of each slot $611B_D$ and $621B_D$, and it is flowed through and done so, Conduction of the inside of the through hole 613B relevant to slot $611B_D$ and $621B_D$ and 72,623B is carried out, and it flows out of the through hole 613B which slot $611B_D$ formed in the separator 61A with which the cell 6A contiguous to the collecting electrode plate 4 is provided has. The fluid 99 for cooling which flowed out of the through hole 613B which slot $611B_D$ has in the stack 1B, Conduction of the inside of the flowing path 44 which the collecting electrode plate 4 has from the closed-end hole 42 which the collecting electrode plate 4 has is carried out, and it flows into the closed-end hole 43 currently formed in the electrical insulation board 92B, and the breakthrough which counters from the closed-end hole 43 which the collecting electrode plate 4 has. Then, it will be discharged by the exterior of the stack 1B from the piping connection object 98 for "exit" parts with which the part of the closed-end hole 43 currently formed in the pressure plate 93B and the breakthrough which counters was equipped.

[0053]Since it had the above-mentioned composition in the example shown in drawing 3 - drawing 5, into the flowing path 44 and 54 which is a heating unit with which the collecting electrode plates 4 and 5 are provided, the fluid 99 for cooling in which temperature rose by carrying out conduction of the layered product of the cell 6A will carry out conduction. The temperature rise value of this fluid 99 for cooling is about 10 as the paragraph of the operation described. The temperature gradient of the fuel cell cell which each cell in the laminating direction of a cell which exists by [**] and is made into the problem in the case of the stack of another side and conventional technology has is 5 as illustrated in drawing 13. [**] It is a grade. Therefore, about 10 There is a possibility of reducing the temperature gradient of the fuel cell cell which each cell in the laminating direction of a cell has without preparing the source of heating separately, if the fluid 99 for cooling which cooled the stack with the temperature rise value of [**] is used.

[0054]Namely, the collecting electrode plates 4 and 5 provided with the flowing paths 44 and 54 like a graphic display, By conduction of the fluid 99 for cooling which carried out the rise in heat to these flowing paths 44 and 54 being carried out, the collecting electrode plates 4 and 5 will sometimes be manufactured with the conducting material which is also a good conductor of heat, and it will be heated almost extensively with the fluid 99 for cooling, and will be positively heated with the fluid 99 for cooling. This becomes possible to reduce the difference in the temperature in the laminating direction of the cell 6A. Then, the electrical insulation boards 92A and 92B used for the stack 1B are manufactured using the electric insulation material, and small one of this electric insulation material is [that thermal conductivity] general as compared with the conducting material used for the collecting electrode plates 4 and 5. In such a case, the collecting electrode plates 4 and 5 can be efficiently heated with the heat of the fluid 99 for cooling which does not very have a big temperature gradient to the temperature of the cell 6A and which carried out the rise in heat. When this heats the collecting electrode plates 4 and 5 with the fluid 99 for cooling which carried out the rise in heat, it is a very desirable thing.

[0055]The composition by the stack 1B hits aiming at reduction of the temperature gradient of the fuel cell cell which each cell in the laminating direction of a cell has, Since it is possible to make the flowing paths 44 and 54 formed in the collecting electrode plate 4 and 5 carry out conduction of the fluid 99 for cooling which carried out the rise in heat directly, there is also an advantage that there is no necessity of preparing piping, a piping connection implement, etc. separately. Then, the stack 1B by Example 3 is being able to use the fluid 99 for cooling which carried out the rise in heat in attaining equalization of the temperature distribution in the laminating direction of the cell 6A as compared with the stacks 1 and 1A by Examples 1 and 2, It

becomes possible to make unnecessary generating of the Joule heat in the heating element 2 grade in the stack 1. This also has the advantage that it is possible only for the part of this Joule heat to increase the output power value of the stack 1B at least.
[0056]Came by old explanation in Example 3 noting that the collecting electrode plates 4 and 5 were provided with the specific flowing paths 44 and 54, but. Not the thing limited to this but the flowing path which carries out conduction of the fluid 99 for cooling with which the collecting electrode plates 4 and 5 are provided, and which carried out the rise in heat, for example, By the situation etc. of the temperature distribution in the temperature-gradient value in the cell laminating direction of the stack of the fuel cell cell central part which each cell has, the specification of a stack, the temperature rise value between "entrance" and the exit" of the fluid 99 for cooling, and the area direction of a fuel cell cell. Of course, it is possible to set up suitably the position of the division into the shape and the locating position of a flowing path, and two or more fork roads of a flowing path, the intake of the fluid 99 for cooling in the collecting electrode plates 4 and 5, and an outlet, etc.
[0057]Came by old explanation in Example 3 noting that the heating unit with which the collecting electrode plate of a solid polyelectrolyte type fuel cell is provided was a flowing path of the fluid 99 for cooling formed in the collecting electrode plate, but. It may be not the thing limited to this but a heating body heated with the fluid 99 for cooling contiguous to a collecting electrode plate, for example. Came by old explanation in Example 3 noting that the fluid 99 for cooling carried out conduction of the cooling unit formed in the separators 61A and 62A with which the cell 6A is provided in the layered product of the cell 6A, but. Not the thing limited to this but the separator with which it does not have the cooling unit to which conduction of the fluid 99 for cooling is carried out, for example as a cell is used, Instead, it has a cooling body for exclusive use, and may be made to supply the heating body which adjoins a collecting electrode plate or a collecting electrode plate via proper piping in the fluid 99 for cooling which carried out conduction of this cooling body for exclusive use, and is heated with the fluid 99 for cooling.
[0058]Example 3 was only according to the composition by Example 3, it came by old explanation in Examples 1-3 noting that it aimed at reduction of the difference in the temperature in the laminating direction of a cell, but it is good at it also as composition which is not limited to this and uses together Example 3 and Examples 1 and 2, for example.
[0059]
[Effect of the Invention]In this invention, it has the above-mentioned composition.
Therefore, the effect which carries out the account of following is done so.

** It becomes possible to attain equalization of distribution of the temperature in the laminating direction of a unit fuel cell. Problems, such as increase of the resistivity value of the solid polyelectrolyte membrane by desiccation of solid polyelectrolyte membrane and inhibition of diffusion of the reactant gas in the electrode by being impregnated with water into an electrode, are solved, and it becomes possible from a ** aforementioned ** paragraph to improve many performances, such as output performance of a solid polyelectrolyte type fuel cell. since there is no necessity of preparing separately the electric power unit for heating and the source device of heating in acquiring the effect by the ** aforementioned ** and ** paragraph, it becomes possible to obtain the solid polyelectrolyte type fuel cell in which many performances, such as said output performance carried out, improved only by the rise of few manufacturing costs. since the increase in part mark does not occur by considering the heating element formed in the part of a collecting electrode plate as the composition which is a collecting electrode plate made from

electrical resistance materials in acquiring the effect by ** aforementioned ** - ** paragraph, It becomes possible to obtain the solid polyelectrolyte type fuel cell in which many performances, such as the above mentioned output performance, improved with a cheap manufacturing cost. In acquiring the effect by ** aforementioned ** - ** paragraph, further again a collecting electrode plate, . Are heated by the fluid for cooling in which temperature rose by cooling a unit fuel cell. For example, by having composition provided with a heating unit, such as being formed in a collecting electrode plate and being in the flowing path for the fluids for cooling which carries out conduction of the fluid for cooling in which temperature rose by cooling a unit fuel cell, Since generating of Joule heat becomes unnecessary in order to attain equalization of distribution of the temperature in the laminating direction of a unit fuel cell, it becomes possible to improve further the output value of the above mentioned solid polyelectrolyte type fuel cell.

TECHNICAL FIELD

[Industrial Application]This invention relates to that structure improved so that equalization of the temperature distribution in the laminating direction of a unit fuel cell of the temperature of the fuel cell cell which a unit fuel cell has might become easy with respect to a solid polyelectrolyte type fuel cell.

PRIOR ART

[Description of the Prior Art]As a fuel cell, various kinds of fuel cells, such as a solid polymer electrolyte type, a phosphoric acid type, a melting carbonate type, and a solid oxide type, are known by the kind of electrolyte used for this. Among this, when a solid polyelectrolyte type fuel cell carries out the water of the polymers resin layer which has a proton (hydrogen ion) exchange group in a molecule to saturation, it is a fuel cell using low resistivity being shown and functioning as a proton conductivity electrolyte. As a polymers resin layer (it is sometimes only henceforth called [solid polyelectrolyte membrane or] PE film for short.) which has a proton exchange group in this molecule, What uses the cation exchange membrane of a polystyrene system with a sulfonic group as a cation conductive film, a perfluoro sulfonic-acid-type-resin film (for example, the U.S. Du Pont make, a trade name Nafion film), etc. are used. By carrying out water to saturation, solid polyelectrolyte membrane (PE film), such as this, is ordinary temperature, and is 20. [Omega-cm] The following resistivity is shown and all function as a proton conductivity electrolyte.

[0003]In a solid polyelectrolyte type fuel cell, on both sides of this PE film, a fuel electrode (it is also an anode pole.), arranging the oxidant electrode (it is also a cathode pole.) -- a fuel electrode -- fuel gas (for example, it is the gas which contained hydrogen or hydrogen in high concentration.) -- oxidant gas (for example, it is air.) is supplied to an oxidant electrode, respectively. In fuel electrodes, such as this, and an oxidant electrode, direct current power is generated because the three-phase zone of the gaseous phase (fuel gas or oxidant gas), the liquid phase (solid polymer electrolyte), and solid phase (catalyst which a fuel electrode and an oxidant electrode have) is formed and the electrochemical reaction which carries out the account of following arises. That is, the reaction by (1) type arises in a fuel electrode.

[0004]
[Formula 1]
$H_2 \rightarrow 2H^+ + 2e^-$ ..... (1)
The reaction by (2) types arises in the oxidant electrode side.
[0005]
[Formula 2]
$(1/2)\ O_2 + 2H^+ + 2e^- \rightarrow H_2O$ .... (2)
The H^+ ion (proton) generated with the fuel electrode as a result of this reaction, e^- (electron) which moved toward the oxidant electrode in the inside of PE film, and was generated with the fuel electrode passes along the load which was connected between the fuel electrode and the oxidant electrode and which is not illustrated, and moves to an oxidant electrode from a fuel electrode. On the other hand, in an oxidant electrode, the oxygen contained in oxidant gas, the H^+ ion which has moved from the fuel electrode in the inside of PE film, and e^- which has moved through load react, and water (H_2O) is generated.
[0006]Drawing 6 is a side sectional view of an important section showing typically the unit fuel cell of the general example which performs the above mentioned operation with which a solid polyelectrolyte type fuel cell is provided in the state where it developed.
Drawing 7 is the perspective view typically shown where the unit fuel cell shown in drawing 6 is developed, and drawing 8 is the figure which looked at the separator which a unit fuel cell has from the direction of P arrow in drawing 6.

[0007]In drawing 6 - drawing 8, 6 is the unit fuel cell (it may be henceforth called a cell for short.) which comprised the fuel cell cell 7 and the separators 61 and 62 which made counter each of the both principal planes, and have been arranged. The fuel cell cell 7 comprised the PE film 7C as an electrolyte layer, the fuel electrode 7A, and the oxidant electrode 7B, and is provided with the function to generate direct current power by the above mentioned place. The PE film 7C is 0.1. [mm] It will have a width dimension of a grade, and an outside dimension of a larger plane direction than the outside dimension of the plane direction of the electrode layers 7A and 7B, and the exposed surface of the PE film 7C will exist [therefore] in the periphery of the electrode layers 7A and 7B between the ends of the PE film 7C.
[0008]The fuel electrode 7A is an electrode which is close to one principal surface of the PE film 7C, is laminated, and receives supply of fuel gas. The oxidant electrode 7B is an electrode which is close to the principal surface of another side of the PE film 7C, is laminated, and receives supply of oxidant gas. The lateral surface of the fuel electrode 7A is one side 7a of the fuel cell cell 7, and the lateral surface of the oxidant electrode 7B is the side 7b of another side of the fuel cell cell 7. As for both the fuel electrode 7A and the oxidant electrode 7B, it is general for it to be had and constituted and to stick with a hotpress the catalyst bed and electrode substrate containing a catalyst active material to the both principal planes of the PE film 7C by the aforementioned catalyst bed side. An electrode substrate supports a catalyst bed, it supplies and discharges reactant gas (there is what fuel gas and oxidant gas are named generically and said in this way henceforth.), and it is a sheet (as the material of construction, carbon paper is used, for example.) of the porosity which has a function as a charge collector. The catalyst bed is formed from the fluoro-resin which has a platinum catalyst of minute particle state, and water repellence in many cases.
And it is considered so that it can contact in a large area to reactant gas by much fine pores being formed in a layer.

Then, in many cases, the width dimension of the fuel cell cell 7 which set the fuel electrode 7A, the PE film 7C, and the oxidant electrode 7B is 1. [mm] It is an order grade.
[0009]By the way, the through hole 71 currently formed in the exposed surface of the PE film 7C is made to counter the through holes 615A and 616A provided in the separator 61, and the through holes 625A and 626A provided in the separator 62, and is formed.
It is a hole which makes a part of flowing path of reactant gas.
The through hole 72 currently similarly formed in the exposed surface of the PE film 7C is made to counter the through holes 613B and 614B provided in the separator 61, and the through holes 623B and 624B provided in the separator 62, and is formed.
It is a hole which makes a part of flowing path of the fluid 99 for cooling which carries out a postscript.

[0010]By the way, in the fuel cell cell 7, since this reaction is an exoergic reaction when generating direct current power according to the electrochemical reaction shown in the above mentioned (1) type and (2) types, it is not avoided that the heat of an equivalent value occurs mostly with the direct-current-power value generated, either. For this reason, the separator 61 and the separator 62, Reactant gas is supplied to the fuel cell cell 7, and the duty which removes the heat generated in the fuel cell cell 7 with extraction from the fuel cell cell 7 of the direct current power generated in the fuel cell cell 7 and generating of direct current power from the fuel cell cell 7 is borne.
[0011]Make the side 61a close to the side 7a of the fuel cell cell 7, and the separator 62 makes the side 62a close to the side 7b of the fuel cell cell 7, and as the separator 61 sandwiches the fuel cell cell 7, respectively, it is allocated. Neither of separators 61 and 62 penetrate gas, but are manufactured using the material (for example, they are carbon, metal, etc.) moreover provided with good thermal conductivity and good electrical conductivity.
[0012]The separators 61 and 62 are equipped with the slot for gas conduction as a means to supply reactant gas to the fuel cell cell 7, respectively. Namely, the separator 61 carries out conduction of the fuel gas to the side 61a side adjacent to the side 7a of the fuel cell cell 7, and. The concave slot (slot for gas conduction) 611A which established the interval for discharging the fuel gas containing unconsumed hydrogen, and were provided, and the convex septum 612A of each other which intervenes between this slot 611A are formed by turns. The separator 62 carries out conduction of the oxidant gas to the side 62a side adjacent to the side 7b of the fuel cell cell 7, and. The concave slot (slot for gas conduction) 621A which established the interval for discharging the oxidant gas containing unconsumed oxygen, and were provided, and the convex septum 622A of each other which intervenes between this slot 621A are formed by turns. The crowning of the convex septa 612A and 622A is formed, respectively so that it may become the same field as each side 61a and 62a of the separators 61 and 62.
[0013]The slots 621A, such as this, become parallel mutually, and the both ends of each slot 621A formed in the separator 62 are opened for free passage by the slots 624A and 624A. One pair of through holes 625A and 625A which carry out an opening to the side 62b side used as an opposite hand are formed in the end of these slots 624A and 624A in the side 62a. One pair of through holes 626A and 626A which connect the side 62a and the side 62b to the separator 62 are formed in the part which serves as the through holes 625A and 625A with the physical relationship of tucking up its sleeves with a cord mutually. The slot 621A, the slot 624A, and the through hole 625A constitute the gas conduction way for carrying out conduction of the oxidant gas in the separator 62.

[0014]The through holes 615A and 615A and the through holes 616A and 616A are formed also in the separator 61. That is, the slots 611A, such as this, become parallel mutually, and the both ends of each slot 611A of the separator 61 are opened for free passage by the slot on the shape as well as the slots 624A and 624A in the case of the separator 62. The opening of the through holes 615A and 615A is carried out to the side [in which the side 61a serves as an opposite hand] 61b side from the end of this slot (it is a slot on the shape like 624A.). As the through holes 616A and 616A connect the side 61a and the side 61b and show them in drawing 7 (a), one pair of through holes 615A and 615A are formed in the part which serves as physical relationship of tucking up its sleeves with a cord mutually. The slot 611A, the aforementioned slot (it is a slot on the shape like 624A.), and the through hole 615A constitute the gas conduction way for carrying out conduction of the fuel gas in the separator 61.
[0015]73 is a gas-seal object made from an elastic material (for example, it is an O ring.) which undertakes the duty which prevents the reactant gas which carries out conduction of the inside of the above mentioned gas conduction way from leaking and coming outside a gas conduction way. The gas-seal object 73 is stored and arranged like the slots 611A and 624A of each separator 61 and 62 all over the slot on the shape, and the slot 619,629 of the concave shape formed in the edge part of the part in which the slots 621A and 624A were formed. Although illustrating omitted, Each opening to the side 61b of the through holes 615A and 616A which the separator 61 has, Each opening to the side 62b of the through holes 625A and 626A which surround each opening to the side 61a of 616A, and the separator 62 has, Each opening to the side 62a of 626A is surrounded, and the slot of the concave shape for storing the gas-seal object made from an elastic material (for example, it is an O ring.) which undertakes the duty which prevents reactant gas from leaking and coming from this part outside a gas conduction way is formed.
[0016]The separators 61 and 62 are equipped with the slot which carries out conduction of the fluid 99 for cooling as a cooling unit for removing the heat generated in the fuel cell cell 7 from the fuel cell cell 7. That is, the two concave slots (slot for the conduction of the fluid 99 for cooling) 621B where the separator 62 makes the side 62b carry out conduction of the fluid 99 for cooling are formed. One pair of through holes 623B and 624B which carry out an opening to the side 62a are formed in the both ends of each slot 621B. Each slot 621B and the through holes 623B and 624B constitute the cooling unit to which conduction of the fluid 99 for cooling in the separator 62 is carried out. The two concave slots (slot for the conduction of the fluid 99 for cooling) 611B which make the side 61b carry out conduction of the fluid 99 for cooling are formed in the separator 61 like the separator 62. One pair of through holes 613B and 614B which carry out an opening to the side 61a are formed in the both ends of each slot 611B. Each slot 611B and the through holes 613B and 614B constitute the cooling unit to which conduction of the fluid 99 for cooling in the separator 61 is carried out.
[0017]Each slot 611B and 621B is surrounded in the side 61b of the separator 61, and the side 62b of the separator 62, and the slots 618B and 628B on the concave shape are formed in them, respectively. The slot of concave shape, such as this, is for storing the seal body (for example, it is an O ring.) of the product made from an elastic material for preventing the fluid 99 for cooling leaking and coming out. Although illustrating omitted, Each opening to the side 61a of the through holes 613B and 614B which the separator 61 has is surrounded, Each opening to the side 62a of the through holes 623B and 624B which the separator 62 has is surrounded, The slot of the concave shape for storing the seal body made from an elastic material (for example, it is an O ring.) which undertakes the duty with which the fluid 99 for cooling prevents leaking and coming

from this part out of a cooling unit is formed.
[0018]The voltage which the one fuel cell cell 7 generates is 1. [V]the cell 6 which has said composition carried out since it is below a grade and a low value -- two or more (they are hundreds of pieces from tens of pieces in many cases.) -- it is general that constitute as a layered product of the cell laminated so that the series connection of the generated voltage of the fuel cell cell 7 might be carried out mutually, raise voltage, and practical use is presented. Drawing 9 is a lineblock diagram of an important section showing typically the solid polyelectrolyte type fuel cell of a conventional example, and (a) is the side view.
(b) is the plan.
Drawing 10 is an explanatory view explaining the flowing path of the fluid for cooling given to the solid polyelectrolyte type fuel cell shown in drawing 9. Into drawing 9, only typical numerals were described about the numerals attached by drawing 6 - drawing 8.
[0019]In drawing 9, 9 is the solid polyelectrolyte type fuel cell (it may be henceforth called a stack for short.) which was constituted by laminating the cell 6 of plurality (the case where the number of the cell 6 was eight pieces was illustrated in drawing 9.) and which made the layered product of the cell 6 the subject. The collecting electrode plates 91 and 91 of the product made from conducting materials, such as a copper material, for the stack 9 to take out the direct current power generated with the cell 6 to the both ends of the layered product of the cell 6 from the stack 9, The electrical insulation boards 92 and 92 made from the electric insulation material for insulating the cell 6 and the collecting electrode plate 91 from a structure electrically, The metal pressure plates 93 and 94, such as iron material allocated in each lateral-surface side of both the electrical insulation boards 92, are laminated one by one, and the both-outsides side sides are consisted of as moderate welding pressure is given to the pressure plates 93 and 94 with two or more clamping bolts 95.
[0020]In the cell 6 which adjoins mutually, the through hole 615A formed in the separator 61, and the through hole 626A formed in the separator 62, The through hole 616A formed in the separator 61 and the through hole 625A formed in the separator 62 make the opening part agree mutually, and is formed. The through hole which is not illustrated, respectively is formed in the through holes 615A and 616A with which the separator 61 of the collecting electrode plate 91, the electrical insulation board 92, and the pressure plate 93 is provided, and the part which counters. The through holes 625A and 626A with which the separator 62 of the collecting electrode plate 91, the electrical insulation board 92, and the pressure plate 94 is provided, and the through hole which is not illustrated to the part which counters, respectively are formed. The gas conduction way for fuel gas and the gas conduction way for oxidant gas which all the cells 6 have in each by this etc. when laminating two or more cells 6 form the gas conduction way which each opened for free passage mutually.
[0021]The through hole 613B formed in the separator 61 in the cell 6 which adjoins mutually and the through hole 623B formed in the separator 62, The through hole 614B formed in the separator 61 and the through hole 624B formed in the separator 62 make the opening part agree mutually, and is formed. The through hole almost of the same shape as the through hole 613B which is not illustrated is formed in each through hole 613B with which the separator 61 of the collecting electrode plate 91, the electrical insulation board 92, and the pressure plate 93 is provided, and the part which counters, respectively. Then, the side used as the lateral surface of the stack 9 of the pressure plate 93 is made to counter each through hole, and is equipped with the piping connection object 98 for fluid 99 for cooling. A through hole is surrounded to each of the opening of the through hole of the both side surfaces of the electrical insulation board 92, and

the opening of a through hole of the side in which it is equipped with the piping connection object 98 of the pressure plate 93, and the slot on the concave shape is formed in it. Each slot is equipped with the seal body made from an elastic material (for example, it is an O ring.) which undertakes the duty with which the fluid 99 for cooling prevents leaking and coming from parts, such as this, out of a cooling unit and which is not illustrated. Each slot 618B currently formed in the separator 61 is also equipped with the seal body which is not illustrated.

[0022]Each through hole 624B with which the separator 62 of the collecting electrode plate 91, the electrical insulation board 92, and the pressure plate 94 is provided, the through hole which is not illustrated to the part which counters as well as the case of the collecting electrode plate 91, the electrical insulation board 92, and the pressure plate 93, and the slot are formed. The side used as the lateral surface of the stack 9 of the pressure plate 94 is made to counter each through hole, and is equipped with the piping connection object 98 for fluid 99 for cooling. Each slot is equipped with the seal body which the seal body which is not illustrated does not illustrate into each slot 628B currently formed in the separator 62 again, either. In this way, when laminating two or more cells 6, as the flowing path of the fluid 99 for cooling which cell 6 grade has in each was shown in drawing 10, it will be mutually open for free passage, and it will be constituted.

[0023]As a result, while was formed in the separator 61 which the cell 6 with which while the pressure plate 93 was equipped adjoins the collecting electrode plate 91 via the piping connection object 98 (it has written with the "entrance" in addition into drawing 10.) etc. has, and the fluid 99 for cooling flows into the slot 611B first. Then, it shunts and flows in the slot 611B and 621B via [each cell 6 has] the through holes 613B and 623B, and via the through holes 614B and 624B etc., the pressure plate 94 was equipped with while and it once flows out of the piping connection object 98 into the exterior of the stack 9. This fluid 99 for cooling that flowed out flows in the piping 97, and flows in in the stack 9 again from the piping connection object 98 of another side with which the pressure plate 94 was equipped. This fluid 99 for cooling flows into the slot 621B of another side formed in the separator 62 which the cell 6 contiguous to the collecting electrode plate 91 has first. Shunt and flow in the slot 611B of another side which each cell 6 has via the through holes 614B and 624B, and 621B, and then, via the through holes 613B and 623B etc., It will be discharged by the exterior of the stack 9 from the piping connection object 98 (it has written with the "exit" in addition into drawing 10.) of another side with which the pressure plate 93 was equipped.

[0024]The clamping bolt 95 is a hexagon head bolt etc. with which it is equipped ranging over the pressure plates 93 and 94, and each clamping bolt 95 pressurizes the cell 6 in the laminating direction in cooperation with this, etc. the hex nut inserted in, etc. the belleville spring for giving the stable welding pressure, etc. This clamping bolt 95 is per surface area of the appearance of the fuel cell cell 7, and the welding pressure which pressurizes the cell 6 is 5. [kg/cm^2] It is general that it is an inside-and-outside grade.

[0025]In the stack 9 constituted in this way, reactant gas flows from the upper part toward the bottom in the slot 611A for gas conduction formed in each separator 61 and 62, and 621A to a gravity direction to a gravity direction, as the arrow showed in drawing 9 (a). And reactant gas will be supplied to parallel about two or more cells 6, respectively. Then, since it is a film which functions as a good proton conductivity electrolyte by making saturation carry out water for getting having mentioned above the PE film 7C currently used for the fuel cell cell 7, reactant gas is humidified and adjusted by the humidity state of a moderate value, and is supplied to it at the stack 9.

[0026]In order to remove the above mentioned heat generated in the fuel cell cell 7 which the

cell 6 has, the stack 9 is supplied the fluid 99 for cooling which is a city water, for example. In the cell 6, the fuel cell cell 7 is cooled via the separators 61 and 62 by this fluid 99 for cooling carrying out conduction, as the inside of each slot 611B formed in the separators 61 and 62 and 621B was already explained using drawing 10 etc. Thereby, the fuel cell cell 7 is 70. [**] ** et al. [80] [**] Being operated by the temperature conditions of a grade is general.

[0027]For example, the number of the slots 611B and 621B established in a separator is made to correspond to some, such as a direct-current-power value generated in the one fuel cell cell 7, and the proper number is chosen.

Therefore, what equips a separator with the four slots 611B and 621B, respectively is known. Plan **** which shows the composition of the important section which showed typically the solid polyelectrolyte type fuel cell of a different conventional example using the unit fuel cell with which drawing 11 was provided with such a separator. Drawing 12 is the figure which looked at the separator used in drawing 11 from the direction of Q arrow in drawing 11. In drawing 11 and drawing 12, the same numerals are given to identical parts and the explanation is abbreviated to the unit fuel cell for the solid polyelectrolyte type fuel cells of the general example shown in drawing 6 - drawing 8, and the solid polyelectrolyte type fuel cell of the conventional example shown in drawing 9. Into drawing 11, only typical numerals were described about the numerals attached by drawing 6 - drawing 9, and drawing 12.

[0028]As opposed to the stack 9 of the conventional example which showed drawing 9 9A in drawing 11 and drawing 12, It changes to the unit fuel cell 6, the collecting electrode plate 91, the electrical insulation board 92, and the pressure plates 93 and 94, and is a unit fuel cell (henceforth). It may be called a cell for short. It is the solid polyelectrolyte type fuel cell (it may be henceforth called a stack for short.) which used 6A, the collecting electrode plate 91A, the electrical insulation board 92A, and the pressure plates 93A and 94A. He changes the cell 6A to the separators 61 and 62 and the fuel cell cell 7, and is trying to use the separators 61A and 62A and the fuel cell cell 8 for it to the cell 6 shown in drawing 6 - drawing 8. Having the four slots 611B and 621B is carrying out difference of the separator 61A and the separator 62A to the separator 61 and the separator 62, respectively. When each of the slots 611B and 621B, such as this, was classified, as it illustrated about the slot 621B in drawing 12, it is $_{(A)}$ to the numerals 611B or 621B... The suffix of $_{(D)}$ will be attached.

[0029]That the number of the slots 611B and 621B and the same number are provided with four pairs (therefore, they are a total of eight pieces.) of through holes 72 formed in PE film which is not illustrated to the fuel cell cell 7 is carrying out difference of the fuel cell cell 8. As shown in drawing 11, the pressure plates 93A and 94A are provided with the four piping connection objects 98 to the pressure plates 93 and 94, respectively. The pressure plate 93A, the collecting electrode plate 91A, and the electrical insulation board 92A, To the pressure plate 93, the collecting electrode plate 91, and the electrical insulation board 92 to each through hole 613B with which the separator 61A is provided, and a part which counters. That each through hole 624B with which the separator 62A is provided, and a through hole which is not illustrated to a part which counters, respectively are formed to the pressure plate 94, the collecting electrode plate 91, and the electrical insulation board 92 is carrying out difference of the pressure plate 94A, the collecting electrode plate 91A, and the electrical insulation board 92A.

[0030]For this reason, fundamentally, a conduction course of the fluid 99 for cooling in the stack 9A is the same as a conduction course of the fluid 99 for cooling in the explained stack 9 using drawing 10 etc. The fluid 99 for cooling in the stack 9A is the course which used a dashed dotted line and an arrow and illustrated the main course in drawing 11, and carries out conduction of the

inside of the stack 9A. That is, the fluid 99 for cooling flows into the stack 9A from the piping connection object 98 (it has written with an "entrance" in addition into drawing 11.) with which the pressure plate 93A is equipped. Then, it flows into a layered product of a cell via the through hole 613B currently formed in slot $611B_A$, and each through hole of the pressure plate 93A currently formed in a part which counters, the collecting electrode plate 91A, and the electrical insulation board 92A, It shunts and flows in slot $611B_A$ which each cell 6A has, and $621B_A$, carrying out conduction of the inside of the through hole 613B relevant to slot $611B_A$ and $621B_A$, and 72,623B. Then, the through holes 614B and 72,624B relevant to slot $611B_A$ and $621B_A$, And it once flows into the exterior of the stack 9 out of the piping connection object 98 with which the pressure plate 94A was equipped via the through hole 624B currently formed in slot $621B_A$, and each through hole of the collecting electrode plate 91A, the electrical insulation board 92A, and the pressure plate 94A which are formed in a part which counters.
[0031]This fluid 99 for cooling that flowed out flows in the piping 97, and flows into the stack 9A again from the piping connection object 98 with which the pressure plate 94A was equipped. This fluid 99 for cooling flows into slot $621B_B$ which the cell 6A contiguous to the collecting electrode plate 91A has and which was formed in the separator 62A first. Then, it shunts and flows in slot $611B_B$, slot $611B_B$ which each cell 6A has via the through holes 614B and 72,624B relevant to $621B_B$, and $621B_B$, The through holes 613B and 72,623B relevant to slot $611B_B$ and $621B_B$, And it flows into the exterior of the stack 9 out of the piping connection object 98 with which the pressure plate 93A was equipped via the through hole 613B currently formed in slot $611B_B$, and each through hole of the collecting electrode plate 91A, the electrical insulation board 92A, and the pressure plate 93A which are formed in the part which counters. Henceforth, the through holes 613B and 72,623B eventually relevant to [repeat this procedure and] slot $611B_D$ and $621B_D$, And via the through hole 613B currently formed in slot $611B_B$, and each through hole of the collecting electrode plate 91A, the electrical insulation board 92A, and the pressure plate 93A which are formed in the part which counters, It will be discharged by the exterior of the stack 9 from the piping connection object 98 (it has written with the "exit" in addition into drawing 11.) with which the pressure plate 93A was equipped.
[0032]A stack provided with a cooling body for exclusive use is also known using [instead] a separator with which it does not have as a cell a slot which carries out conduction of the fluid 99 for cooling again. In this case, it is general to supply the fluid 99 for cooling to a cooling body via proper piping.

EFFECT OF THE INVENTION

[Effect of the Invention]In this invention, it has the above-mentioned composition.
Therefore, the effect which carries out the account of following is done so.

** It becomes possible to attain equalization of distribution of the temperature in the laminating direction of a unit fuel cell. Problems, such as increase of the resistivity value of the solid polyelectrolyte membrane by desiccation of solid polyelectrolyte membrane and inhibition of diffusion of the reactant gas in the electrode by being impregnated with water into an electrode, are solved, and it becomes possible from a ** aforementioned ** paragraph to improve many performances, such as output performance of a solid polyelectrolyte type fuel cell. since there is no necessity of preparing separately the electric power unit for heating and the source device of

heating in acquiring the effect by the ** aforementioned ** and ** paragraph, it becomes possible to obtain the solid polyelectrolyte type fuel cell in which many performances, such as said output performance carried out, improved only by the rise of few manufacturing costs. since the increase in part mark does not occur by considering the heating element formed in the part of a collecting electrode plate as the composition which is a collecting electrode plate made from electrical resistance materials in acquiring the effect by ** aforementioned ** - ** paragraph, It becomes possible to obtain the solid polyelectrolyte type fuel cell in which many performances, such as the above mentioned output performance, improved with a cheap manufacturing cost. In acquiring the effect by ** aforementioned ** - ** paragraph, further again a collecting electrode plate, . Are heated by the fluid for cooling in which temperature rose by cooling a unit fuel cell. For example, by having composition provided with a heating unit, such as being formed in a collecting electrode plate and being in the flowing path for the fluids for cooling which carries out conduction of the fluid for cooling in which temperature rose by cooling a unit fuel cell, Since generating of Joule heat becomes unnecessary in order to attain equalization of distribution of the temperature in the laminating direction of a unit fuel cell, it becomes possible to improve further the output value of the above mentioned solid polyelectrolyte type fuel cell.

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention]In the solid polyelectrolyte type fuel cell by the conventional technology mentioned above, although it is cooled with the fluid 99 for cooling via a separator etc., and fuel cell cell 7 grade is held for operation of a stack at optimal temperature and fully exhibits the function of direct-current power generation, there is a problem which carries out the account of following. Namely, in the stacks 9 and 9A by conventional technology, etc., It is that there is a fact [illustrated / to drawing 13 / distribution of laminating directions of the temperature of fuel cell cell 7 grade which each cell 6 and 6A has, such as the cells 6 and 6A,] that it is high in the center section of the laminating direction, and low at the both ends of a laminating direction. Drawing 13 is a graph which shows the example of measurement of the temperature distribution of the central part in the area direction of the fuel cell cell which each unit fuel cell has in the unit fuel cell laminating direction of the solid polyelectrolyte type fuel cell of a conventional example here.

[0034]In the fuel cell cell 7 which became a high temperature because the temperature distribution in a cell laminating direction is not uniform, and 8 grades, since evaporation of water is promoted, the fuel cell cell 7, the PE film 7C currently used for 8 grades, etc. are dried. On the other hand, in the fuel cell cell 7 from which the temperature distribution in a cell laminating direction became a low temperature because it is not uniform, and 8 grades, the degree which moisture solidifies on the surface becomes high by the amount of evaporation of water being reduced with the fuel cell cell 7, the fuel electrode 7A currently used for 8 grades, and the oxidant electrode 7B.

[0035]The resistivity value increases with the characteristic character which PE film which mentioned above the dry PE film 7C has. Since the electric resistance value of PE film will increase if the resistivity value of PE film increases as a result, the loss by Joulian heat in the fuel cell cell 7 and 8 grades will increase, and the generation efficiency will fall. In the fuel electrode 7A and the oxidant electrode 7B in which the surface was covered with water, that power generation performance will fall by it being impregnated with this water into an electrode, and

checking the diffusion in the electrode of reactant gas.
[0036]The heterogeneity of the temperature distribution in the laminating direction of the cell which brings about the performance degradation of stacks, such as this, In the both ends of the laminating direction of the cell in the stacks 9 and 9A etc. It is equipped with the collecting electrode plates 91 and 91A, the pressure plates 93 and 93A, the pressure plates 94 and 94A, etc., When the cell using the separator with which it has the slot which carries out conduction of the fluid 99 for cooling as a cell is adopted, The cooling unit formed in the separator by the side of the collecting electrode plate which the cell allocated in the both ends of a stack has originates in having only one fuel cell cell etc. as a fuel cell cell of a cooling object. That is, conducting materials used for the collecting electrode plates 91 and 91A, such as a copper material, are also the good conductors of heat. Although metallic materials, such as iron material, are used in consideration of a mechanical strength as for the pressure plates 93, 93A, 94, and 94A, metallic materials, such as this, are also the good conductors of heat. Since existence of thermal conductors, such as this, makes the amount of heat leakage from this part increase, the temperature of both ends, such as the stacks 9 and 9A, falls. The temperature of fuel cell cells, such as this, falls because the degree cooled with the separator which cools only one fuel cell cell as compared with the fuel cell cell allocated in other parts in the fuel cell cell which the cell allocated in the both ends which have one side cooled has becomes large.
[0037]this invention is made in view of the problem of the above-mentioned conventional technology, and comes out. The purpose has equalization of distribution of the temperature in the laminating direction of a fuel cell in the easy thing for which a solid polyelectrolyte type fuel cell is provided.

MEANS

[Means for Solving the Problem]A fuel cell cell in which the above-mentioned purpose generates direct current power in response to supply of 1 fuel gas and oxidant gas in this invention, One pair of separators with which a gas conduction slot for making each of both principal planes of a fuel cell cell counter, being arranged, and supplying fuel gas or oxidant gas to a fuel cell cell is formed, Have two or more ****** unit fuel cells, and unit fuel cells, such as this, Make the side by the side of an anti-gas conduction slot of the separator counter the side by the side of an anti-gas conduction slot of a separator which a unit fuel cell which adjoins each other mutually has, and a layered product of an adjacent unit fuel cell and a unit fuel cell laminated mutually is made, A collecting electrode plate made from a conducting material contacted by lateral surface of a separator of a layered product of this unit fuel cell located in both terminals at least, An electrical insulation board made from an electric insulation material contacted by lateral surface of a collecting electrode plate located in a both-ends tail of a layered product of a unit fuel cell at least of collecting electrode plates, such as this, A pressure plate which gives welding pressure which is contacted by lateral surface of an electrical insulation board located in a both-ends tail of a layered product of a unit fuel cell at least of electrical insulation boards, such as this, and pressurizes a layered product of a unit fuel cell, a collecting electrode plate, and an electrical insulation board in laminating directions, such as this, It has a piping connection object for fluids for cooling installed in a part which supplies a fluid for cooling from which heat generated in a fuel cell cell is removed, and a part to discharge, A fluid for cooling from which heat generated in a fuel cell cell is removed, . After being supplied from the outside of a layered product of a

unit fuel cell via a piping connection object for supply sides of a fluid for cooling and cooling a unit fuel cell, it is what is discharged by the exterior of a layered product of a unit fuel cell via a piping connection object for the discharge sides of a fluid for cooling. In a solid polyelectrolyte type fuel cell, to a part of a collecting electrode plate contacted by lateral surface of a separator of a layered product of a unit fuel cell located in both terminals at least. It has composition in which it comes to form a heating element heated by current which a solid polyelectrolyte type fuel cell outputs, Or a heating element formed in a part of a collecting electrode plate in a means given in 2 aforementioned 1 paragraph, It has composition which is a heating element of being laminated and a product made from electrical resistance materials ****(ed) between a layered product of a unit fuel cell, and a collecting electrode plate, Or a fuel cell cell which generates direct current power in response to supply of considering a heating element formed in a part of a collecting electrode plate in a means given in 3 aforementioned 1 paragraph as composition which is a collecting electrode plate made from electrical resistance materials or 4 fuel gas, and oxidant gas, One pair of separators with which a gas conduction slot for making each of both principal planes of a fuel cell cell counter, being arranged, and supplying fuel gas or oxidant gas to a fuel cell cell is formed, Have two or more ****** unit fuel cells, and unit fuel cells, such as this, Make the side by the side of an anti-gas conduction slot of the separator counter the side by the side of an anti-gas conduction slot of a separator which a unit fuel cell which adjoins each other mutually has, and a layered product of an adjacent unit fuel cell and a unit fuel cell laminated mutually is made, A collecting electrode plate made from a conducting material contacted by lateral surface of a separator of a layered product of this unit fuel cell located in both terminals at least, An electrical insulation board made from an electric insulation material contacted by lateral surface of a collecting electrode plate located in a both-ends tail of a layered product of a unit fuel cell at least of collecting electrode plates, such as this, A pressure plate which gives welding pressure which is contacted by lateral surface of an electrical insulation board located in a both-ends tail of a layered product of a unit fuel cell at least of electrical insulation boards, such as this, and pressurizes a layered product of a unit fuel cell, a collecting electrode plate, and an electrical insulation board in laminating directions, such as this, A fluid for cooling from which heat which was provided with a piping connection object for fluids for cooling installed in a part which supplies a fluid for cooling from which heat generated in a fuel cell cell is removed, and a part to discharge, and was generated in a fuel cell cell is removed, . After being supplied from the outside of a layered product of a unit fuel cell via a piping connection object for supply sides of a fluid for cooling and cooling a unit fuel cell, it is what is discharged by the exterior of a layered product of a unit fuel cell via a piping connection object for the discharge sides of a fluid for cooling. In a solid polyelectrolyte type fuel cell, a collecting electrode plate to having composition provided with a heating unit heated by a fluid for cooling in which temperature rose by cooling a unit fuel cell, and a pan. Or a heating unit with which a collecting electrode plate equips 5 aforementioned 4 paragraph in a means of a statement is formed in a collecting electrode plate, and is attained more, without temperature considering a fluid for cooling which went up as composition which is a flowing path for fluids for cooling which carries out conduction by cooling a unit fuel cell.

OPERATION

[Function]In this invention, in a solid polyelectrolyte type fuel cell (stack) to the part of the collecting electrode plate contacted by the lateral surface of the separator of the layered product of (1) unit fuel cell (cell) located in both terminals at least. For example, it has composition in which it comes to form the heating element heated by the current which stacks, such as a heating element of being laminated and the product made from electrical resistance materials ****(ed) between the layered product of a cell and a collecting electrode plate, output.
Therefore, conduction of the current outputted from a stack will be carried out to a heating element, and the Joule heat of the value proportional to the product of the electric resistance value which a heating element has in a heating element for this reason, and the square value of the current value by which conduction is carried out to a heating element occurs.
A thing, such as making the value of the Joule heat generated with this heating element into the value corresponding to the quantity of heat diffused from the end of the laminating direction of the cell of a stack, enables it to attain equalization of distribution of the temperature in the laminating direction of a cell.
[0040](2) By considering the heating element formed in the part of a collecting electrode plate in the aforementioned (1) paragraph as the composition which is a collecting electrode plate made from electrical resistance materials, Since conduction of the current outputted from a stack is carried out to a collecting electrode plate, the Joule heat of the value proportional to the product of the electric resistance value which a collecting electrode plate has in a collecting electrode plate, and the square value of the current value by which conduction is carried out to a collecting electrode plate occurs. A thing, such as making the value of the Joule heat generated from this collecting electrode plate into the value corresponding to the quantity of heat diffused from the end of the laminating direction of the cell of a stack, enables it to attain equalization of distribution of the temperature in the laminating direction of a cell like the case of the aforementioned (1) paragraph.
(3) This invention is 10 by the case where the fluid for cooling which cools a stack carries out a rise in heat by cooling a stack, and that temperature rise value is a stack of a conventional example. [**] It notes recognizing grade existence. . Namely, a collecting electrode plate is heated by the fluid for cooling in which temperature rose by cooling a cell. For example, it will be formed in a collecting electrode plate and a collecting electrode plate will be positively heated with the fluid for cooling in which temperature rose via the heating unit by having composition provided with a heating unit, such as being in the flowing path for the fluids for cooling which carries out conduction of the fluid for cooling in which temperature rose by cooling a cell. A thing, such as making heating quantity of the collecting electrode plate heated with the fluid for cooling in which this temperature rose into the value corresponding to the quantity of heat diffused from the end of the laminating direction of the cell of a stack, enables it to attain equalization of distribution of the temperature in the laminating direction of a cell.

EXAMPLE

[Example]The example of this invention is described in detail with reference to drawings below. Example 1; drawing 1 is that plan showing typically the composition of the important section of the solid polyelectrolyte type fuel cell by one example of this invention corresponding to claims 1 and 2. In drawing 1, the same numerals are given to the solid polyelectrolyte type fuel cell and identical parts by the conventional example shown in drawing 9 etc., and the explanation is

omitted. Into drawing 1, only typical numerals were described about the numerals attached by drawing 6 - drawing 10. In drawing 1, 1 to the solid polyelectrolyte type fuel cell 9 by the conventional example shown in drawing 9 etc. between each collecting electrode plate 91 and the cell 6 which adjoins this collecting electrode plate 91, It is a solid polyelectrolyte type fuel cell (it may be henceforth called a stack for short.) which comes to **** the laminated heating element 2. The heating element 2 is an alloy for electric heat (the volume resistivity value is 1.0-1.5). [muomegam] it is a grade. etc. -- the sheet metal made from electrical resistance materials being formed in an area equivalent to the area direction size which the fuel electrode 7A and the oxidant electrode 7B have, and the thickness of the heating element 2, It is preferred that it is determined that the value of the Joule heat generated in the heating element 2 by the current outputted from the stack 1 turns into a value corresponding to the quantity of heat diffused from the end of the laminating direction of the stack 1.

[0042]Since it had the above-mentioned composition in the example shown in drawing 1, conduction of the current outputted to each heating element 2 from the stack 1 will be carried out to the thickness direction. For this reason, the Joule heat of the value proportional to the product of the electric resistance value which the heating element 2 has, and the square value of the current value outputted from the stack 1 occurs in the heating element 2, and the heating element 2 functions on it as an electric heating unit. The value of this Joule heat generated from the heating element 2, Since it is the value which balanced mostly the quantity of heat diffused from the end of the laminating direction of the cell 6 of the stack 1 from the above mentioned electric resistance value which the heating element 2 has, The quantity of heat diffused from the end of the laminating direction of the cell 6 of the stack 1 and the value of the Joule heat generated with each heating element 2 will be offset mostly. Therefore, in the stack 1, the temperature of the fuel cell cell 7 which each cell 6 has becomes possible [using the same value mostly in the laminating direction of the cell 6]. Then, there is also an advantage that there is no necessity of preparing separately the power supply for the electric heating units for equalizing the temperature distribution in the laminating direction of the cell 6 by the ability of the output current of the stack 1 which carries out conduction of the inside of the stack 1 to be used.

[0043]Example 2; drawing 2 is that plan showing typically the composition of the important section of the solid polyelectrolyte type fuel cell by one example of this invention corresponding to claims 1 and 3. In drawing 2, the same numerals are given to the solid polyelectrolyte type fuel cell and identical parts by the conventional example shown in drawing 9 etc., and the explanation is omitted. Into drawing 2, only typical numerals were described about the numerals attached by drawing 6 - drawing 10. In drawing 2, 1A is the solid polyelectrolyte type fuel cell (it may be henceforth called a stack for short.) which changes to the collecting electrode plate 91 and used the collecting electrode plate 3 to the solid polyelectrolyte type fuel cell 9 by the conventional example shown in drawing 9 etc. The collecting electrode plate 3 is an alloy for electric heat (the volume resistivity value is 1.0-1.5). [muomegam] it is a grade. etc. -- it is manufactured using electrical resistance materials. As for the electric resistance value of the collecting electrode plate 3, it is preferred that it is determined that the value of the Joule heat generated in the collecting electrode plate 3 by the current outputted from the stack 1A turns into a value corresponding to the quantity of heat diffused from the end of the laminating direction of the stack 1A.

[0044]Since it had the above-mentioned composition in the example shown in drawing 2, conduction of the current outputted from the stack 1A will be carried out to each collecting electrode plate 3. For this reason, the Joule heat of the value proportional to the product of the

electric resistance value which the collecting electrode plate 3 has, and the square value of the current value outputted from the stack 1A occurs in the collecting electrode plate 3, and the collecting electrode plate 3 functions on it also as an electric heating unit. The value of this Joule heat generated from the collecting electrode plate 3, Since it is the value which balanced mostly the quantity of heat diffused from the end of the laminating direction of the cell 6 of the stack 1A from the above mentioned electric resistance value which the collecting electrode plate 3 has, The quantity of heat diffused from the end of the laminating direction of the cell 6 of the stack 1A and the value of the Joule heat generated with each collecting electrode plate 3 will be offset mostly. Therefore, in the stack 1A, the temperature of the fuel cell cell 7 which each cell 6 has becomes possible [using the same value mostly in the laminating direction of the cell 6]. Then, as compared with the stack 1 by Example 1, since the heating element 2 is unnecessary, the stack 1A by Example 2 does not increase part mark, and it has the advantage that it is possible to attain equalization for the temperature distribution in the laminating direction of the cell 6. The stack 1A also has the advantage that there is no necessity of preparing separately the power supply for the electric heating units for equalizing the temperature distribution in the laminating direction of the cell 6 by the ability of the output current of the stack 1A which carries out conduction of the inside of the stack 1A to be used like the case of the stack 1.

[0045]Example 3; drawing 3 is that plan showing typically the composition of the important section of the solid polyelectrolyte type fuel cell by one example of this invention corresponding to claims 4 and 5. Drawing 4 is the figure seen from the direction [in / a part of (a) of a collecting electrode plate fractures, and / drawing 3] of R arrow while it was shown in drawing 3.

(b) is an A-A view figure in drawing 4 (a).

A part of (a) of the collecting electrode plate of another side which showed drawing 5 in drawing 3 is the figure which was fractured and was seen from the direction of S arrow in drawing 3.

(b) is a B-B view figure in drawing 5 (a).

In drawing 3, the same numerals are given to the collecting electrode plate and identical parts which are used for the solid polyelectrolyte type fuel cell by a different conventional example shown in drawing 11 etc., and the solid polyelectrolyte type fuel cell of a different conventional example shown in drawing 11, and the explanation is omitted. Into drawing 3, only typical numerals were described about the numerals attached by drawing 4 - drawing 12.

[0046]As opposed to the solid polyelectrolyte type fuel cell 9A by the conventional example which showed drawing 11 etc. 1B in drawing 3, It changes to the pressure plate 93A by the side of the "entrance" of the collecting electrode plate 91A and the fluid 99 for cooling, and an "exit", and the electrical insulation board 92A, Respectively, it is the solid polyelectrolyte type fuel cell (it may be henceforth called a stack for short.) which used the collecting electrode plate 4, the collecting electrode plate 5 and the pressure plate 93B, and the electrical insulation board 92B. Change the collecting electrode plate 4 to the breakthrough which stands in a row to the "exit" of the fluid 99 for cooling among the breakthroughs currently formed in each through hole 613B with which the separator 61A is provided, and the part which counters to the collecting electrode plate 91A, and have the closed-end hole 42, and. Having the closed-end hole 43 and the flowing path 44 of the fluid 99 for cooling which is a heating unit is carrying out difference. That is, the through hole 41 is formed in the through hole 613B currently formed in the slot 611B in which the separator 61A has the collecting electrode plate 4, and the part which counters. The through hole 613B by which through hole 41_A is formed in slot $611B_A$ among this through hole 41, Through hole 41_B is the through hole 613B currently formed in slot $611B_B$, and through hole 41

$_C$ is formed in each of the through hole 613B currently formed in slot $611B_C$, and the part which counters.

[0047]45 and 45 are through holes which make counter the through holes 615A and 616A by the side of a reactant gas inflow in the through hole 615A with which the separator 61A is provided, and 616A, and are formed. 46 is a terminal area for taking out the output current of the stack 1B. In order to make the clamping bolt 95 penetrate, it has the through hole 47 currently formed in the terminal area 46 if needed.

In order to equip with the connection body which takes out output current and which is not illustrated, it has the through hole 48 if needed.

The opening of the closed-end hole 42 is carried out to the side [in which it contacts the separator 61A for each other] 4a side.

The opening of the closed-end hole 43 is carried out to the side side of the opposite hand to the side 4a.

Both the closed-end holes 42 and 43 are connected within the collecting electrode plate 4, and the flowing path 44 of the fluid 99 for cooling is formed like the graphic display. This closed-end hole 42 is formed in the through hole 613B currently formed in slot $611B_D$ which the separator 61A has, and the part which counters.

[0048]The inside of the breakthrough currently formed in each through hole 624B which the separator 62A equips with the collecting electrode plate 5 to the collecting electrode plate 91A, and the part which counters, Change to the breakthrough which stands in a row in slot $621B_D$ in which it changes to the breakthrough which stands in a row in slot $621B_C$ which the separator 62A has, and the separator 62A has the closed-end hole 52, and it has the closed-end hole 53, and having the flowing path 54 of the fluid 99 for cooling which is a heating unit is carrying out difference. That is, the through hole 51 is formed in the through hole 624B currently formed in the slot 621B in which the separator 62A has the collecting electrode plate 5, and the part which counters. The through hole 624B by which through hole 51 $_A$ is formed in slot $621B_A$, and through hole 51 $_B$ are formed in the through hole 624B currently formed in slot $621B_B$, and each and the part which counters among this through hole 51. 55 and 55 are through holes which make counter the through holes 625A and 626A by the side of a reactant gas outflow in the through hole 625A with which the separator 62A is provided, and 626A, and are formed. 56 is a terminal area for taking out the same output current of the stack 1B as the terminal area 46 which the collecting electrode plate 4 has. In order to make the clamping bolt 95 penetrate, it has the through hole 57 currently formed in the terminal area 56 if needed.

In order to equip with the connection body which takes out output current and which is not illustrated, it has the through hole 58 if needed.

The opening of both the closed-end hole 52 and the closed-end hole 53 is carried out to the side [in which it contacts the separator 62A for each other] 5a side, both the closed-end holes 52 and 53 are connected within the collecting electrode plate 5, and the flowing path 54 of the fluid 99 for cooling is formed like the graphic display.

[0049]That the breakthrough is formed in the closed-end hole 43 with which the collecting electrode plate 4 is provided, and the part which counters to the pressure plate 93A and the electrical insulation board 92A, respectively is carrying out difference of the pressure plate 93B and the electrical insulation board 92B. Then, the piping connection object 98 of the "exit" part of the fluid 99 for cooling is a part of this breakthrough with which the pressure plate 93B is provided, and the pressure plate 93B is equipped with it.

[0050]The conduction course of the fluid 99 for cooling in the stack 1B with the composition

mentioned above, Conduction of the inside of the through hole 613B relevant to slot $611B_C621B_C$ which each cell 6A has, and 72,623B is carried out, Shunt the inside of each slot $611B_C$ and $621B_C$, and it is flowed through and done so, Conduction of the inside of the through hole 614B relevant to slot $611B_C$ and $621B_C$ and 72,624B is carried out, Till the place which flows out of the through hole 624B which slot $621B_C$ formed in the separator 62A with which the cell 6A contiguous to the collecting electrode plate 5 is provided has, it is completely the same as that of the conduction course of the fluid 99 for cooling in the stack 9A.

[0051]After the fluid 99 for cooling flowed out of the through hole 624B which slot $621B_C$ has in the stack 1B, conduction is carried out in the following course. That is, conduction of the inside of the flowing path 54 which the collecting electrode plate 5 has first from the closed-end hole 52 which the collecting electrode plate 5 has is carried out, and it flows into the layered product of a cell from the closed-end hole 53 which the collecting electrode plate 5 has via the through hole 624B which slot $621B_D$ formed in the separator 62A with which the cell 6A is provided has. Therefore, the piping connection object 98 and the piping 97 are unnecessary between them.

[0052]The fluid 99 for cooling which re-flowed into the layered product of the cell from the through hole 624B which slot $621B_D$ has, Like the case of the stack 9A, carrying out conduction of the inside of the through hole 624B relevant to slot $611B_D$ and $621B_D$, and 72,624B. Shunt the inside of each slot $611B_D$ and $621B_D$, and it is flowed through and done so, Conduction of the inside of the through hole 613B relevant to slot $611B_D$ and $621B_D$ and 72,623B is carried out, and it flows out of the through hole 613B which slot $611B_D$ formed in the separator 61A with which the cell 6A contiguous to the collecting electrode plate 4 is provided has. The fluid 99 for cooling which flowed out of the through hole 613B which slot $611B_D$ has in the stack 1B, Conduction of the inside of the flowing path 44 which the collecting electrode plate 4 has from the closed-end hole 42 which the collecting electrode plate 4 has is carried out, and it flows into the closed-end hole 43 currently formed in the electrical insulation board 92B, and the breakthrough which counters from the closed-end hole 43 which the collecting electrode plate 4 has. Then, it will be discharged by the exterior of the stack 1B from the piping connection object 98 for "exit" parts with which the part of the closed-end hole 43 currently formed in the pressure plate 93B and the breakthrough which counters was equipped.

[0053]Since it had the above-mentioned composition in the example shown in drawing 3 - drawing 5, into the flowing path 44 and 54 which is a heating unit with which the collecting electrode plates 4 and 5 are provided, the fluid 99 for cooling in which temperature rose by carrying out conduction of the layered product of the cell 6A will carry out conduction. The temperature rise value of this fluid 99 for cooling is about 10 as the paragraph of the operation described. The temperature gradient of the fuel cell cell which each cell in the laminating direction of a cell which exists by [**] and is made into the problem in the case of the stack of another side and conventional technology has is 5 as illustrated in drawing 13. [**] It is a grade. Therefore, about 10 There is a possibility of reducing the temperature gradient of the fuel cell cell which each cell in the laminating direction of a cell has without preparing the source of heating separately, if the fluid 99 for cooling which cooled the stack with the temperature rise value of [**] is used.

[0054]Namely, the collecting electrode plates 4 and 5 provided with the flowing paths 44 and 54 like a graphic display, By conduction of the fluid 99 for cooling which carried out the rise in heat to these flowing paths 44 and 54 being carried out, the collecting electrode plates 4 and 5 will sometimes be manufactured with the conducting material which is also a good conductor of heat,

and it will be heated almost extensively with the fluid 99 for cooling, and will be positively heated with the fluid 99 for cooling. This becomes possible to reduce the difference in the temperature in the laminating direction of the cell 6A. Then, the electrical insulation boards 92A and 92B used for the stack 1B are manufactured using the electric insulation material, and small one of this electric insulation material is [that thermal conductivity] general as compared with the conducting material used for the collecting electrode plates 4 and 5. In such a case, the collecting electrode plates 4 and 5 can be efficiently heated with the heat of the fluid 99 for cooling which does not very have a big temperature gradient to the temperature of the cell 6A and which carried out the rise in heat. When this heats the collecting electrode plates 4 and 5 with the fluid 99 for cooling which carried out the rise in heat, it is a very desirable thing.
[0055]The composition by the stack 1B hits aiming at reduction of the temperature gradient of the fuel cell cell which each cell in the laminating direction of a cell has, Since it is possible to make the flowing paths 44 and 54 formed in the collecting electrode plate 4 and 5 carry out conduction of the fluid 99 for cooling which carried out the rise in heat directly, there is also an advantage that there is no necessity of preparing piping, a piping connection implement, etc. separately. Then, the stack 1B by Example 3 is being able to use the fluid 99 for cooling which carried out the rise in heat in attaining equalization of the temperature distribution in the laminating direction of the cell 6A as compared with the stacks 1 and 1A by Examples 1 and 2, It becomes possible to make unnecessary generating of the Joule heat in the heating element 2 grade in the stack 1. This also has the advantage that it is possible only for the part of this Joule heat to increase the output power value of the stack 1B at least.
[0056]Came by old explanation in Example 3 noting that the collecting electrode plates 4 and 5 were provided with the specific flowing paths 44 and 54, but. Not the thing limited to this but the flowing path which carries out conduction of the fluid 99 for cooling with which the collecting electrode plates 4 and 5 are provided, and which carried out the rise in heat, for example, By the situation etc. of the temperature distribution in the temperature-gradient value in the cell laminating direction of the stack of the fuel cell cell central part which each cell has, the specification of a stack, the temperature rise value between "entrance" and the exit" of the fluid 99 for cooling, and the area direction of a fuel cell cell. Of course, it is possible to set up suitably the position of the division into the shape and the locating position of a flowing path, and two or more fork roads of a flowing path, the intake of the fluid 99 for cooling in the collecting electrode plates 4 and 5, and an outlet, etc.
[0057]Came by old explanation in Example 3 noting that the heating unit with which the collecting electrode plate of a solid polyelectrolyte type fuel cell is provided was a flowing path of the fluid 99 for cooling formed in the collecting electrode plate, but. It may be not the thing limited to this but a heating body heated with the fluid 99 for cooling contiguous to a collecting electrode plate, for example. Came by old explanation in Example 3 noting that the fluid 99 for cooling carried out conduction of the cooling unit formed in the separators 61A and 62A with which the cell 6A is provided in the layered product of the cell 6A, but. Not the thing limited to this but the separator with which it does not have the cooling unit to which conduction of the fluid 99 for cooling is carried out, for example as a cell is used, Instead, it has a cooling body for exclusive use, and may be made to supply the heating body which adjoins a collecting electrode plate or a collecting electrode plate via proper piping in the fluid 99 for cooling which carried out conduction of this cooling body for exclusive use, and is heated with the fluid 99 for cooling.
[0058]Example 3 was only according to the composition by Example 3, it came by old explanation in Examples 1-3 noting that it aimed at reduction of the difference in the temperature

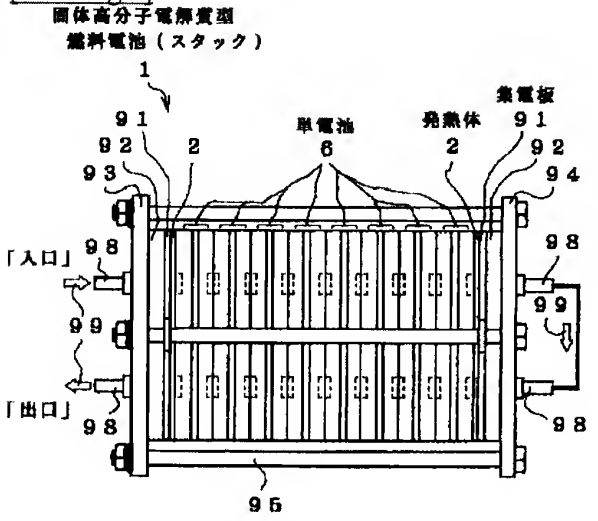
in the laminating direction of a cell, but it is good at it also as composition which is not limited to this and uses together Example 3 and Examples 1 and 2, for example.

DESCRIPTION OF DRAWINGS

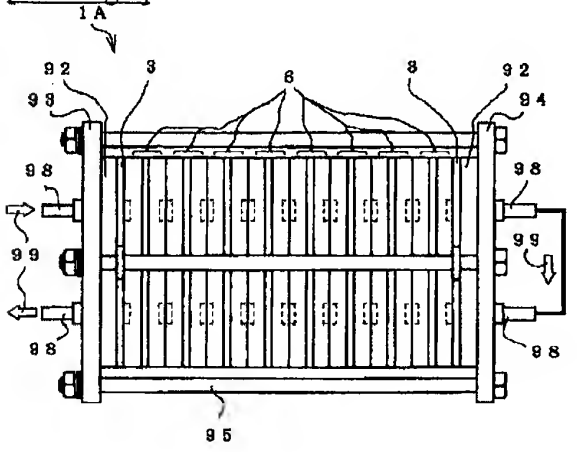
[Brief Description of the Drawings]
[Drawing 1]That plan showing typically the composition of the important section of the solid polyelectrolyte type fuel cell by one example of this invention corresponding to claims 1 and 2
[Drawing 2]That plan showing typically the composition of the important section of the solid polyelectrolyte type fuel cell by one example of this invention corresponding to claims 1 and 3
[Drawing 3]That plan showing typically the composition of the important section of the solid polyelectrolyte type fuel cell by one example of this invention corresponding to claims 4 and 5
[Drawing 4](b) is the figure seen from the direction [in / a part of (a) of a collecting electrode plate fractures, and / drawing 3] of R arrow while it was shown in drawing 3, and an A-A view figure in drawing 4 (a).
[Drawing 5]As for a part of (a) of the collecting electrode plate of another side shown in drawing 3, (b) is the figure which was fractured and was seen from the direction of S arrow in drawing 3, and a B-B view figure in drawing 5 (a).
[Drawing 6]The side sectional view of the important section typically shown where the unit fuel cell of the general example with which a solid polyelectrolyte type fuel cell is provided is developed
[Drawing 7]The perspective view typically shown where the unit fuel cell shown in drawing 6 is developed
[Drawing 8]The figure which looked at the separator which a unit fuel cell has from the direction of P arrow in drawing 6
[Drawing 9]It is a lineblock diagram of an important section showing typically the solid polyelectrolyte type fuel cell of a conventional example, and as for (a), it is the side view and (b) is the plan.
[Drawing 10]The explanatory view explaining the flowing path of the fluid for cooling given to the solid polyelectrolyte type fuel cell shown in drawing 9
[Drawing 11]The plan showing the composition of the important section which showed typically the solid polyelectrolyte type fuel cell of a different conventional example
[Drawing 12]The figure which looked at the separator used in drawing 11 from the direction of Q arrow in drawing 11
[Drawing 13]The graph which shows the example of measurement of the temperature distribution of the central part in the area direction of the fuel cell cell which each unit fuel cell has in the unit fuel cell laminating direction of the solid polyelectrolyte type fuel cell of a conventional example
[Description of Notations]
1 Solid polyelectrolyte type fuel cell (stack)
2 Heating element
6 Cell
91 Collecting electrode plate

DRAWINGS

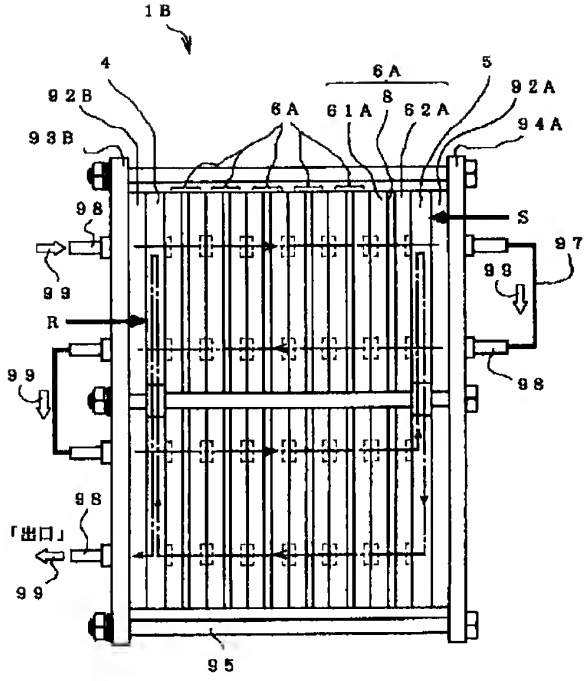
[Drawing 1]



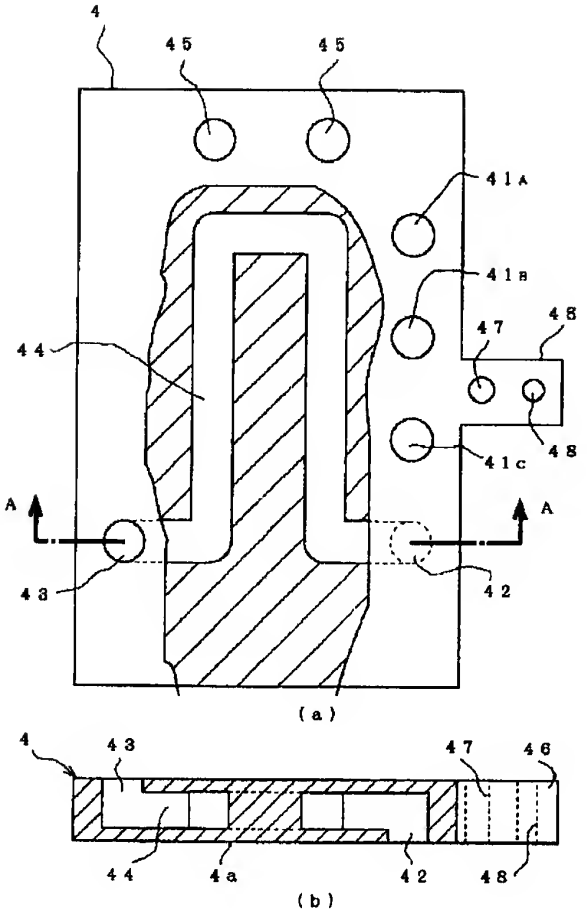
[Drawing 2]



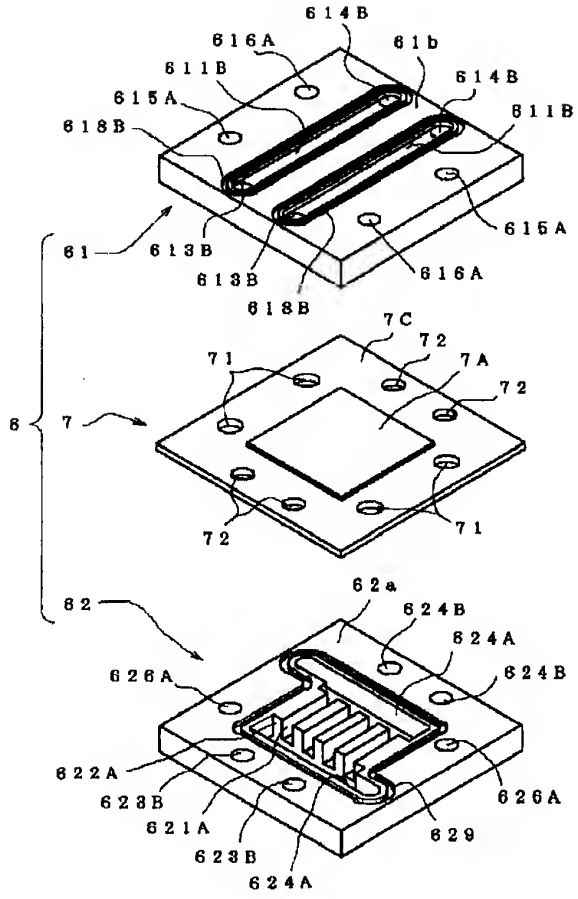
[Drawing 3]



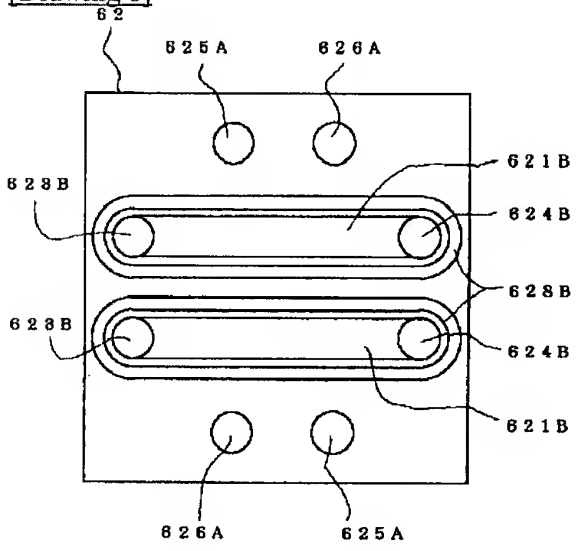
[Drawing 4]



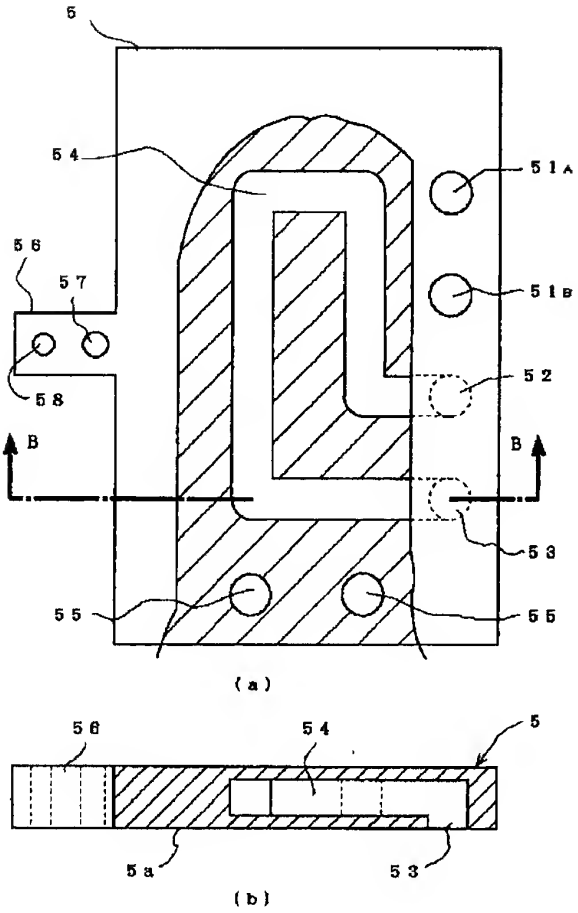
[Drawing 7]



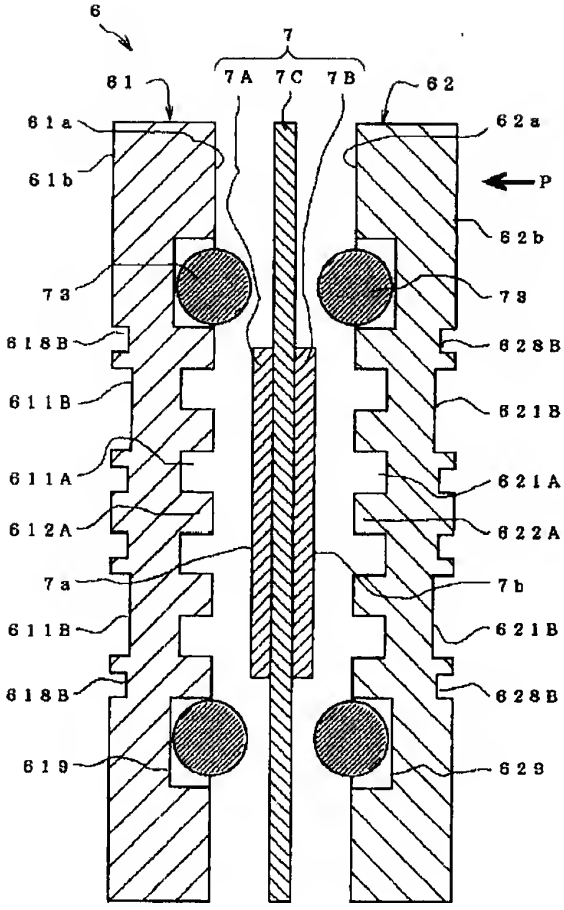
[Drawing 8]



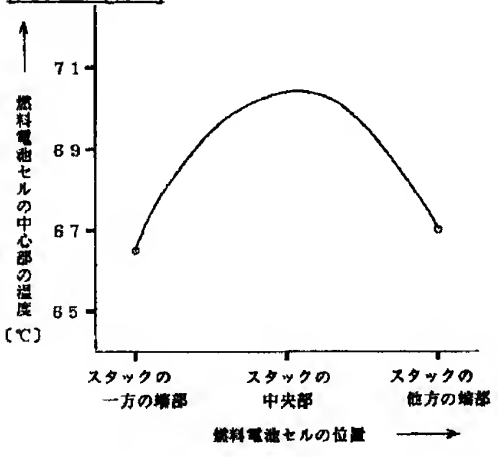
[Drawing 5]



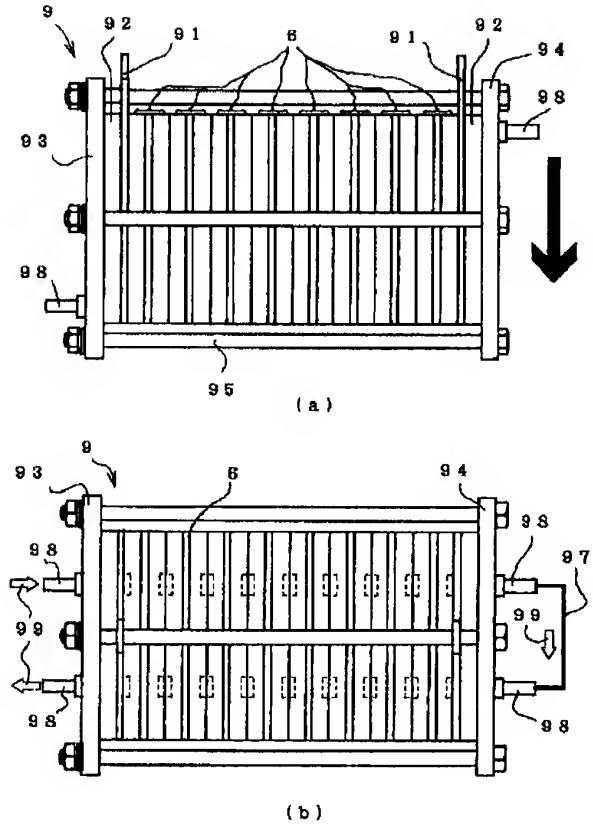
[Drawing 6]



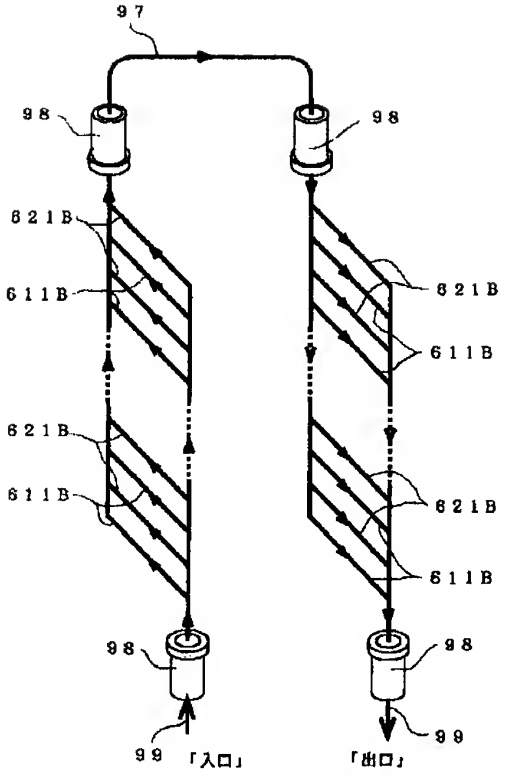
[Drawing 13]



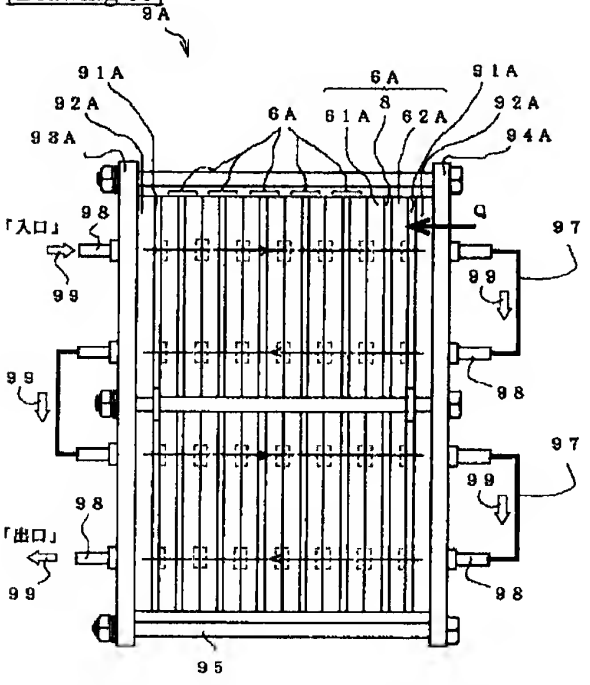
[Drawing 9]



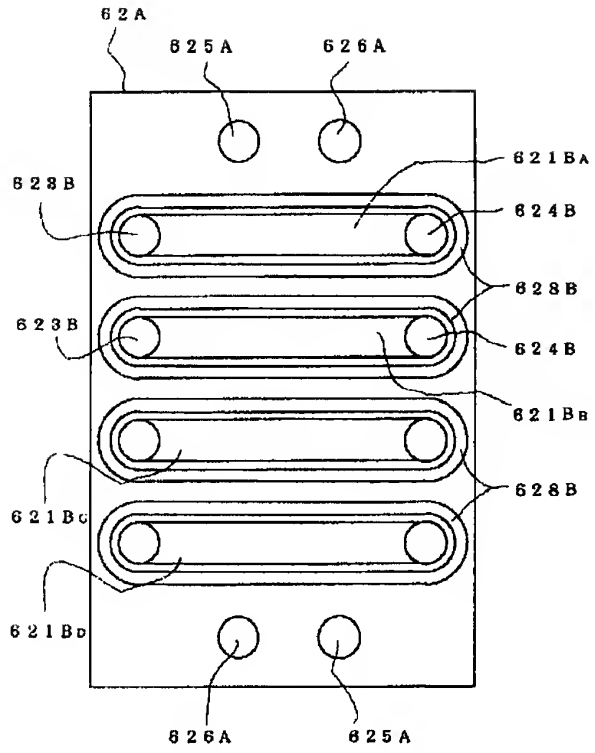
[Drawing 10]



[Drawing 11]



[Drawing 12]



[Translation done.]